

ALLAN CARLOS PSCHIEDT

O gênero *Microstachys* A. Juss. e a tribo Hippomaneae (Euphorbiaceae)

Tese apresentada ao Instituto de Botânica
da Secretaria do Meio Ambiente, como
parte dos requisitos exigidos para a
obtenção do título de DOUTOR em
BIODIVERSIDADE VEGETAL E
MEIO AMBIENTE, na Área de
Concentração de Plantas Vasculares em
Análises Ambientais.

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**“Foi o tempo que dedicastes à tua rosa
que a fez tão importante”**

Antoine de Saint-Exupéry

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Table 1. Distribution of Neotropical species of <i>Microstachys</i> . Morrone's 2014 provinces: ARF (<i>Araucaria</i> Forest), ATL (Atlantic), CAA (Caatinga), CER (Cerrado), CHA (Chacoan), CUB (Cuban), GUA (Guajira), GUL (Guianan Lowlands), GUT (Guatuso-Talamanca), JAM (Jamaica), LAN (Lesser Antilles), MAD (Madeira), MAG (Magdalena), PAM (Pampean), PAR (Pará), PFL (Pacific Lowlands), PRC (Puerto Rico), PRF (Parana Forest), PRM (Paramo), PUC (Puntarenas-Chiriqui), PUN (Puna), RON (Rondonia), ROR (Roraima), SAB (Sabana), TRI (Trinidad), XIT (Xingu-Tapajós), YUN (Yungas).	29
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A família Euphorbiaceae é uma das maiores, mais diversas e complexas das Angiospermas, sendo a mais numerosa da ordem Malpighiales. Em meio à subfamília Euphorbioideae, encontra-se a tribo Hippomaneae com 33 gêneros, dos quais 13 estão presentes no Brasil, alguns deles com circunscrição não satisfatoriamente resolvida. *Microstachys*, por outro lado, é um dos gêneros morfológicamente mais distintos da tribo, apesar disso, várias de suas espécies foram originalmente descritas ou tratadas em diferentes gêneros como *Sebastiania*, *Stillingia* e *Tragia*. O presente trabalho teve por objetivos: 1) Inferir uma filogenia para o gênero *Microstachys*, de maneira a tecer uma hipótese sobre sua origem, parentesco com outros gêneros da tribo, origem e diversificação. 2) Realizar uma revisão taxonômica de suas espécies. Foram reconhecidas 24 espécies: Das 19 neotropicais, três possuem ampla distribuição pela América do Sul (*Microstachys bidentata*, *M. corniculata* e *M. salicifolia*), sete são restritas à sub-região Chaquenha de Morrone (*M. crotonoides*, *M. daphnoides*, *M. ditassoides*, *M. glandulosa*, *M. hispida*, *M. marginata* e *M. serrulata*) e nove são endêmicas, oito das quais distribuídas nos campos rupestres, cerrados e campos sulinos do Brasil (*M. anisodonta*, *M. heterodoxa*, *M. liliputiana*, *M. nana*, *M. nummularifolia*, *M. revoluta*, *M. stipulacea* e *M. uleana*) e uma do cerrado no Paraguay (*M. dasycarpa*). Das cinco espécies extra-americanas, todas ocorrem na África, em savanas (*M. acetosella*, *M. dalzielii*, *M. faradianensis* e *M. linearis*) e principalmente planícies arenosas costeiras (*M. chamaelea*), sendo que esta última também é encontrada na Ásia e Austrália. As espécies de *Microstachys* podem ser utilizadas como indicadoras de savanas. As análises filogenéticas com base em marcadores nucleares e de chloroplasto indicaram o monofiletismo de *Microstachys*, sua diversificação na região Neotropical há cerca de 15 milhões de anos e reconheceram duas linhagens para o gênero, uma delas que inclui as espécies de maior distribuição geográfica pela região neotropical e outra com as espécies mais restritas e endêmicas.

Palavras-chave: Filogenia, Fitogeografia, Taxonomia, *Gymnanthes*, *Mabea*, *Sebastiania*

ABSTRACT

Euphorbiaceae is one of the biggest, most complex and diverse families of Angiosperms, and the largest one within Malpighiales. Within Euphorbioideae, is Hippomaneae, with 33 genera, 13 of them present in Brazil and some of them with an unsatisfactorily resolved circumscription. *Microstachys*, on the other hand, is one of the most morphologically distinct genera within the tribe. However, many of its species were originally described or treated in different genera as *Sebastiania*, *Stillingia* and *Tragia*. The present work had as objectives: 1) Infer a phylogeny for *Microstachys*, to propose hypothesis about its origin, relationships with other genera from Hippomaneae and diversification; 2) Produce a taxonomic revision of its species. Twenty four species were recognized: 19 neotropical, three of them widely distributed throughout South America (*M. bidentata*, *M. corniculata* and *M. salicifolia*), seven are restricted to Morrone's Chacoan subregion (*M. crotonoides*, *M. daphnoides*, *M. ditassoides*, *M. glandulosa*, *M. hispida*, *M. marginata* and *M. serrulata*) and nine are endemic, eight of them occurring on Brazilian campos rupestres, cerrados and pampas (*M. anisonta*, *M. heterodoxa*, *M. liliputiana*, *M. nana*, *M. nummularifolia*, *M. revoluta*, *M. stipulacea* and *M. uleana*) and one from Paraguayan cerrados (*M. dasycarpa*). Five species are extra-neotropical, all of them occurring in Africa, on savannahs (*M. acetosella*, *M. dalzielii*, *M. faradianensis* and *M. linearis*) and mainly on seashore sandy plains (*M. chamaelea*). *M. chamaelea* is also found in Asia and Australia. The species of *Microstachys* can be used as savanna's indicator species. Phylogenetic analysis based on nuclear and chloroplast markers indicates the monophyly of *Microstachys* and that its diversification in the Neotropical region occurred about 15 million years ago and recognized two lineages for the genus, one of them mostly with widely distributed species in the Neotropical region and the other one with restricted and endemic species.

Keywords: Euphorbiaceae, Phylogenetics, Taxonomy, *Gymnanthes*, *Mabea*, *Sebastiania*.

INTRODUÇÃO GERAL

MALPIGHIALES E A FAMÍLIA EUPHORBIACEAE

A ordem Malpighiales representa cerca de 8% de toda biodiversidade das Eudicotiledôneas (MAGALLÓN *et al.*, 1999) e é um grupo ecologicamente e morfológicamente bastante diversificado que tem aproximadamente 16.000 espécies distribuídas em 42 famílias (APG III, 2009; WURDACK & DAVIS, 2009). A ordem, segundo Wurdack & Davis (2009), é um dos clados mais surpreendentes descobertos em estudos filogenéticos com as Angiospermas e, apesar de monofilético, carece de sinapomorfias morfológicas.

A família Euphorbiaceae sempre foi uma das maiores, mais diversas e complexas das Angiospermas, sendo a mais numerosa da ordem (WURDACK & DAVIS, 2009) com ocorrência de espécies em todo o globo, principalmente nas regiões tropicais (GOVAERTS *et al.*, 2000). Euphorbiaceae foi originalmente descrita por JUSSIEU (1789) no seu *Genera Plantarum* e, em sua delimitação tradicional, apresentava tal variabilidade morfológica, que apenas as flores unissexuadas e os óvulos providos de obturador placentário, características não exclusivas, eram compartilhadas por todos os seus representantes.

CHASE *et al.* (1993, 2002), em seus estudos filogenéticos baseados em dados moleculares, demonstraram claramente o polifiletismo das Euphorbiaceae *s. lat.* Por não encontrarem evidências moleculares que as sustentassem, CHASE *et al.* (2002) propuseram formalmente uma nova delimitação da família, excluindo dela os grupos com lóculos 2-ovulados, ou seja, as subfamílias Phyllanthoideae e Oldfieldioideae, e restringindo, assim, a família apenas às subfamílias 1-ovuladas: Euphorbioideae, Crotonoideae e Acalyphoideae, enquanto que as Phyllanthoideae foram desmembradas nas famílias Phyllanthaceae e Putranjivaceae, e as Oldfieldioideae compuseram a família Picrodendraceae. Mais recentemente, DAVIS *et al.* (2007) demonstraram que as Euphorbiaceae *s.str.* também não são monofiléticas, pois, na filogenia proposta por estes autores, a família Rafflesiaceae, conhecida mais por suas espécies parasitas de flores gigantes, admiravelmente emergia entre os gêneros de Euphorbiaceae *s.str.* Posteriormente, WURDACK & DAVIS (2009) revisando as relações filogenéticas entre as famílias da ordem Malpighiales corroboraram os resultados encontrados por DAVIS *et al.* (2007) e, para tornar as Euphorbiaceae monofiléticas, elevaram a subfamília Peroideae a status de família (Peraceae), tornando assim Euphorbiaceae *s. str.* monofilética. Contudo, o APGIII (2009), mesmo aceitando o posicionamento de Rafflesiaceae na ordem Malpighiales, não reconhece a família Peraceae. Mesmo em sua circunscrição mais restrita a família ainda é uma das maiores, mais diversas e complexas, com 246 gêneros e aproximadamente 6.300 espécies (WURDACK & DAVIS, 2009).

As Euphorbiaceae *s.str.* possuem hábito bastante variado, com espécies herbáceas, arbustivas ou arbóreas, as vezes suculentas e cactiformes como em *Euphorbia*, monóicas ou dióicas, frequentemente com látex colorido ou leitoso. Suas folhas são alternas ou opostas, mais raramente verticiladas, simples ou compostas, e neste caso digitadas, de nervação pinada ou palmada, as estípulas são livres ou unidas, reduzidas a glândulas ou ausentes. Possuem indumento variado, de tricomas estrelados a escamiformes, mas alguns representantes são glabros. As inflorescências são terminais ou axilares, basicamente cimosas, mas geralmente descritas como pseudoracemos, espigas, panículas, fascículos, dicásios, e outras do tipo pseudanto, como nos gêneros *Dalechampia* e *Euphorbia*, neste último mais conhecido como ciátio. As flores são unissexuais, actinomorfas, raramente zigomorfas, monoclamídeas, diclamídeas ou aclamídeas. O número de estames é muito variável, com filetes livres ou unidos e anteras rimosas; os grãos de pólen são tectados ou não-tectados, inaperturados ou poliaperturados, na maioria 3-colporados (WEBSTER, 1967). Uma importante característica da família é o ovário tricarpelar e trilocular, com cada lóculo contendo um óvulo de placentação axilar; os estiletes podem ser inteiros ou ramificados, livres ou unidos. O fruto é tipicamente uma cápsula de deiscência septicida-loculicida, com uma semente por lóculo, de tegumento externo fino, ósseo ou carnoso, provida ou não de carúncula, com endosperma abundante.

O maior gênero da família é *Euphorbia* L., com mais de 2.000 espécies e inclui plantas caracterizadas pela presença de pseudantos, denominados ciátios, inflorescências reduzidas, com flores limitadas a estames ou ovários únicos envoltos por brácteas e nectários extraflorais, seguido de *Croton* L., com 1.223 espécies e *Acalypha* L., com 450 espécies. Todos os três gêneros são pantropicais (GOVAERTS *et al.*, 2000).

Algumas espécies da família apresentam grande importância econômica, podendo ser destacadas: *Manihot esculenta* Crantz, a mandioca, *Hevea brasiliensis* Müll. Arg., a seringueira, e *Ricinus communis* L., a mamona. Na utilização ornamental, destacam-se espécies como: *Euphorbia milii* Desmoul., a coroa-de-cristo; *E. pulcherrima* Willd. ex. Klotzsch, o bico-de-papagaio; *Codiaeum variegatum* (L.) A. Juss., o cróton dos floricultores e *Acalypha hispida* Burm. f., conhecida como rabo-de-gato.

HIPPOMANEAE

Na subfamília Euphorbioideae, a tribo Hippomaneae é a segunda maior depois de Euphorbieae. Apesar das mudanças em sua circunscrição e classificação ao longo tempo, Hippomaneae sempre foi uma das tribos tradicionalmente reconhecidas nas Euphorbiaceae *s. lat.* (ESSER, 2012). JUSSIEU (1824) foi quem primeiro descreveu a tribo em seu estudo dos gêneros da família Euphorbiaceae. Posteriormente a tribo foi aceita com pequenos ajustes na sua circunscrição:

ENDLICHER (1840) tratou Hippomaneae como tribo da família Euphorbiaceae incluindo os gêneros: *Adenopeltis* Bertero ex A. Juss., *Colliguaja* Molina, *Commia* Lour., *Excoecaria* L., *Hura* L., *Hippomane* L., *Maprounea* Aubl., *Microstachys* A. Juss., *Omalanthus* A. Juss., *Pachystemon* Blume, *Stillingia* Garden ex L., *Styloceras* Kunth ex A. Juss. e *Synaspisma* Endl. O gênero *Styloceras* é atualmente reconhecido em meio as Buxaceae. *Hura* é reconhecido na tribo Hureae. *Pachystemon* (= *Macaranga* Thouars) é atualmente reconhecido na tribo Acalypheae (RADCLIFFE-SMITH, 2001).

Nas contribuições da família Euphorbiaceae para a América do Sul, BENTHAM (1843), reconhece a tribo Hippomaneae descrevendo um novo gênero, *Dactylostemon* Klotzsch, e duas novas espécies, uma para *Microstachys* A. Juss. e a outra para *Sapium* Jacq., que é então posicionado em Hippomaneae. BENTHAM (1854) descreveu os gêneros e algumas novas espécies de Euphorbiaceae para a região norte do Brasil, com base nas coleções de Richard Spruce. Apesar de não utilizar um sistema de classificação baseado em tribos, contribui com descrições para os gêneros *Gymnanthes* Sw., *Hura* L., *Maprounea* Aubl., *Microstachys* A. Juss., *Omphalea* L. e *Sapium* Jacq., reconhecidos então em Hippomaneae.

AGARDH (1858) em seu estudo das fanerógamas reconheceu a tribo como uma família distinta de Euphorbiaceae. A família, segundo ele, se relaciona com Apocynaceae e Rizophoraceae. BAILLON (1858), que atuou no herbário de Paris, em seu estudo dos gêneros de Euphorbiaceae reconheceu 10 gêneros de Hippomaneae em Stillingiidae: *Actinostemon* Mart. ex Klotzsch, *Adenopeltis* Bertero ex A. Juss., *Colliguaja* Mollina, *Falconeria* Royle, *Gymnanthes* Sw., *Hippomane* L., *Omalanthus* A. Juss., *Omphalea* L., *Senefeldera* Mart. e *Stillingia* Garden ex L. Desses, foi em *Stillingia* Garden ex L. que combinou diversos outros gêneros antes reconhecidos para Hippomaneae.

MÜLLER (1863) em seu estudo preliminar da família Euphorbiaceae reconhece a tribo Hippomaneae e nela 21 gêneros: *Actinostemon* Mart. ex Klotzsch, *Adenopeltis* Bertero ex A. Juss., *Algernonia* Baill., *Carumbium* Reinw., *Colliguaja* Molina, *Conosapium* Müll. Arg., *Dactylostemon* Klotzsch, *Dalembertia* Baill., *Elachocroton* F. Muell., *Excoecaria* L., *Falconeria* Royle, *Gymnanthes* Sw., *Gymnostillingia* Müll. Arg., *Hippomane* L., *Maprounea* Aubl., *Microstachys* A. Juss., *Omphalea* L., *Sapiopsis* Müll. Arg., *Sapium* Jacq., *Senefeldera* Mart. e *Stillingia* Garden ex L.

No estudo da flora das Índias Ocidentais (atual Caribe) GRISEBACH (1864) transferiu Hippomaneae como subtribo da tribo Crotoneae. A esta subtribo reconheceu seis gêneros: *Excoecaria* L., *Hippomane* L., *Hura* L., *Microstachys* A. Juss., *Omphalea* L. e *Sapium* Jacq. No *Prodromus De Candolle*, MÜLLER (1866) reconhece, para a tribo Hippomaneae, 52 gêneros e 16 subtribos para acomodá-los. Muitos dos gêneros das subtribos Carumbieae e Euhippomaneae ainda são reconhecidos em Hippomaneae (RADCLIFFE-SMITH, 2001): *Actinostemon* Mart. ex Klotzsch, *Adenopeltis* Bertero ex A. Juss., *Carumbium* Reinw. (= *Homalanthus* A. Juss.), *Conosapium* Müll. Arg., *Colliguaja* Molina, *Dactylostemon* Klotzsch (= *Actinostemon*), *Dalembertia* Baill., *Excoecaria* L., *Gymnostillingia* Müll. Arg. (= *Stillingia* Garden ex L.), *Hippomane* L., *Mabea* Aubl., *Maprounea* Aubl., *Sebastiania* Spreng., *Senefeldera* Mart., *Stillingia*, *Taeniosapium* Müll. Arg. (= *Excoecaria*) e *Wartmannia* Müll. Arg. (= *Homalanthus* A. Juss.). O gênero *Ophthalmoblapton* Allemão é atualmente reconhecido na tribo Hureae, junto com os gêneros *Algernonia* Baill., *Hura* L. e *Tetraplandra* Baill.

Outros gêneros de MÜLLER (1866) estão atualmente reconhecidos em tribos da subfamília Acalyphoideae: *Bennettia* R. Br. (= *Galearia* Zoll. & Moritzi, Dicoelieae), *Chaetocarpus* Thwaites (Chaetocarpaceae), *Cheilosa* Blume (Cheiloseae), *Clutia* L. (Clutieae), *Erismanthus* Wall. ex Müll. Arg. (Erismanthaceae), *Microdesmis* Planch. (Galearieae), *Omphalea* L. (Omphaleae), *Pogonophora* Miers ex Benth. (Pgonophoreae); na subfamília Crotonoideae: *Acidocroton* Griseb. (Codiaeae), *Adenocline* Turcz (Adenoclineae), *Baliospermum* Blume (Codiaeae), *Codiaeum* Rumph. ex A. Juss. (Codiaeae), *Cunuria* Baill. (Micrandreae), *Ditta* Griseb. (Adenoclineae), *Elateriospermum* Blume (Elateriospermeae), *Endospermum* Benth. (Adenoclineae), *Gelonium* Roxb. ex Willd. (Gelonieae), *Givotia* Griff. (Ricinodendreae), *Jatropha* L. (Jatropheae), *Manihot* Mill. (Manihoteae), *Ostodes* Blume (Codiaeae), *Paracroton* Miq. (Crotoneae), *Paradenocline* Müll. Arg. (= *Adenocline*, Adenoclineae), *Ricinodendron* Müll. Arg. (Ricinodendreae), *Sagotia* Baill. (Codiaeae), *Tetrorchidium* Poepp. & Endl. (Adenoclineae), *Trigonostemon* Blume (Trigonostemoneae); e na subfamília Euphorbioideae: *Stomatocalyx* Müll.

Arg. (Stomatocalyceae). Enquanto que o gênero *Mischodon* Thwaites é atualmente reconhecido na família Picrodendraceae e o gênero *Phyllobotryum* Müll. Arg. em Salicaceae.

Na *Flora Brasiliensis* MÜLLER (1874) reconhece para Hippomaneae 23 gêneros para o Brasil, organizados em oito subtribos. Muitas espécies e variedades novas foram descritas para o Brasil, representando um grande centro de diversidade da tribo. BAILLON (1874) reconhece a tribo Excoecarieae e nela 12 gêneros: *Algernonia* Baill., *Anthostema* A. Juss., *Carumbium* Reinw., *Dalembertia* Baill., *Excoecaria* L., *Hippomane* L., *Hura* L., *Omphalea* L., *Ophthalmoblapton* Allemão, *Pachystroma* Müll. Arg., *Senefeldera* Mart. e *Tetraplandra* Baill. O gênero *Anthostema* é atualmente reconhecido na tribo Euphorbieae. *Hura*, *Ophthalmoblapton* e *Tetraplandra* na tribo Hureae. *Pachystroma* é reconhecido na tribo Pachystromateae (RADCLIFFE-SMITH, 2001). É possível notar o grande número de combinações de BAILLON (1874), por exemplo: os gêneros *Cnemidostachys* Mart. & Zucc., *Gymnanthes* Sw., *Maprounea* Aubl., *Microstachys* A. Juss., *Sapium* Jacq., *Sebastiania* Spreng. e *Stillingia* Garden ex L., agora combinados em *Excoecaria* L. BENTHAM & HOOKER (1880) em seu *Genera Plantarum* resgata o tratamento de GRISEBACH (1864) e trata Hippomaneae como subtribo de Crotonae. BENTHAM (1878) já considerava este posicionamento da tribo.

O último estudo completo da tribo Hippomaneae, incluindo chaves de identificação, descrições e ilustrações, foi o de PAX & HOFFMANN (1912). Foram reconhecidos 26 gêneros e nove novas subtribos para acomodá-los. A subtribo Adenopeltinae foi reconhecida com os gêneros *Adenopeltis* Bertero ex A. Juss., *Colliguaja* Molina, *Dalembertia* Baill. e *Ditta* Griseb. (atualmente reconhecido na tribo Adenoclineae). A subtribo Excoecariinae, com os gêneros *Corythea* S. Watson (atualmente reconhecido na tribo Acalypheae), *Excoecaria* L. e *Spirostachys* Sond. A subtribo Gymnanthinae, com os gêneros *Actinostemon* Mart. ex Klotzsch, *Gymnanthes* Sw. e *Sebastiania* Spreng. A subtribo Homalanthinae, com os gêneros *Homalanthus* A. Juss. e *Pimeleodendron* Hassk. (atualmente reconhecido na tribo Stomacalyceae). A subtribo Hurinae, com os gêneros *Algernonia* Baill., *Tetraplandra* Baill. E *Hura* L., ambos atualmente reconhecidos na tribo Hureae. A subtribo Mabeinae, com os gêneros *Mabea* Aubl. e *Senefeldera* Mart. A subtribo Omphaleinae, com o gênero *Omphalea* L. (reconhecido na tribo Omphaleae). A subtribo Stillingiinae, com os gêneros *Bonania* A. Rich., *Grimmeodendron* Urb., *Hippomane* L., *Maprounea* Aubl., *Sapium* Jacq. E *Stillingia* Garden ex L. E a subtribo Trisyngyninae, com o gênero *Trisyngyne* Baill., que erroneamente atribuído às Euphorbiaceae é atualmente reconhecido em meio às Fagaceae (HJELMQVIST, 1963).

Segundo WEBSTER (1994), além da dificuldade em reconhecer os limites dessas subtribos, também os gêneros aí reconhecidos possuem circunscrições incertas e controversas. WEBSTER (1975) posicionou a tribo Hippomaneae na subfamília Euphorbioideae, quando apresentou sua classificação em cinco subfamílias para as Euphorbiaceae *s. lat.*, posição aceita por autores posteriores (GILBERT, 1994; ESSER *et al.*, 1997; ESSER, 2001). Na classificação da família Euphorbiaceae WEBSTER (1994) reduziu a três as subtribos de Hippomaneae: Hippomaninae, com flores masculinas de receptáculo plano e não achatado lateralmente, reunindo Adenopeltinae, Excoecariinae, Gymnanthinae e Stillingiinae; Carumbiinae (Holomanthinae de PAX & HOFFMANN, 1912) com receptáculo plano e lateralmente achatado e Mabeinae, com receptáculo convexo ou cônico.

Em sua recente circunscrição (ESSER, 2001), a tribo está organizada em duas subtribos: Carumbiinae, com apenas um gênero, *Homalanthus* A. Juss, com cerca de 25 espécies; e Hippomaninae, englobando as subtribos Hippomaninae e Mabeinae reconhecidas por WEBSTER (1994). Hippomaninae possui 33 gêneros e cerca de 300 espécies distribuídas nas Américas, África, Ásia e Oceania (ESSER, 1999; 2001).

Na análise filogenética realizada por WURDACK *et al.* (2005) com as Euphorbiaceae *s. str.*, gêneros das tribos Hureae e Pachystromateae emergiram em meio aos da tribo Hippomaneae, indicando seu parafiletismo e também, que as classificações tradicionais mostram que a circunscrição dos seus gêneros é ainda controversa e necessita de estudos mais abrangentes. Recentemente BALAKRISHNAN & CHAKRABARTY (2007) estabeleceram a tribo como subfamília de Euphorbiaceae, mas, segundo ESSER (2012), não apresentaram uma justificativa convincente para essa proposta e nenhum outro trabalho corrobora com os autores.

A tribo Hippomaneae está, segundo ESSER (2012), representada por 34 gêneros e aproximadamente 325 espécies. Essas são árvores, arbustos, lianas ou ervas, com indumento ou este nulo, látex branco. As folhas são pecioladas, com estípulas ou estas nulas, solitárias, penínérveas, as vezes triplinérveas, com glândulas na face abaxial e/ou na face adaxial. As inflorescências são tirso terminais ou axilares, alongados ou glomeruliformes, com címulas femininas na base e masculinas no ápice, brácteas com glândulas ou estas raramente nulas, címulas femininas com 1 flor, as masculinas com 1-ca. 30 flores. Gemas florais inclinadas, cobertas por brácteas ou raramente catafilos (como em *Actinostemon*). Flores masculinas sésseis a pediceladas, cálice (1)2-5-lobado, actinomórfico, bilateral ou zigomórfico, livre ou fundido; estames 1-ca. 100, livres a conatos. Flores femininas sésseis a pediceladas, cálice (1)2-6(9)-lobado, actinomórfico ou bilateral, livre ou fundido; ovário 1-9-locular, estigmas íntegros a raramente bifidos no ápice, com glândulas na base

ou estas nulas. Frutos septícida, loculícida ou indeiscente, epicarpo seco ou carnososo, endocarpo lenhoso. Sementes 1-9 por fruto, secas ou com arilo, carunculadas ou não.

Os gêneros *Adenopeltis* Bertero ex A. Juss., *Anomostachys* (Baill.) Hurus, *Ditrysinia* Raf., *Falconeria* Royle, *Neoshirakia* Esser, *Pseudosenefeldera* Esser e *Spegazziniophytum* Esser. são monoespecíficos na subtribo Hippomaninae (ESSER, 2001). Aqueles com poucas espécies incluem: *Balakata* Esser (com 2 espécies), *Colliguaja* Molina (com 4), *Conosapium* Müll. Arg. (com ca. 4), *Dalembertia* Baill. (com ca. 4), *Dendrocousinsia* Millsp. (com ca. 3), *Dendrothrix* Esser (com 3), *Grimmeodendron* Urb. (com 2), *Hippomane* L. (com ca. 3), *Maprounea* Aubl. (com ca. 5), *Pleradenophora* Esser (com 3), *Rhodothyrsus* Esser (com 2), *Sclerocroton* Hochst. (com 6), *Senefeldera* Mart. (com 3), *Senefelderopsis* Steyerl. (com 2), *Shirakiopsis* Esser (com 6), *Spirostachys* Sond. (com ca. 3) e *Triadica* Lour. (com ca. 4).

Já, os maiores gêneros, em número de espécies, são: *Actinostemon* Mart. ex Klotzsch (com 13 espécies), *Bonania* A. Rich. (com ca. 10), *Excoecaria* L. (com ca. 35), *Gymnanthes* Sw. (com ca. 45), *Mabea* Aubl. (com 39), *Microstachys* A. Juss. (objeto de estudo desta tese), *Sapium* Jacq. (com ca. 25), *Sebastiania* Spreng. (com ca. 25) e *Stillingia* Garden ex L. (com ca. 27).

MICROSTACHYS

Entre os maiores gêneros em número de espécies da tribo Hippomaneae encontra-se o gênero *Microstachys* A. Juss. As espécies ocorrem em vegetações savânicas do mundo inteiro (fig. 1), com maior concentração de espécies na América do Sul, onde o Brasil é seu centro de diversidade, e outras poucas no continente Africano e uma com ampla distribuição até a Oceania.

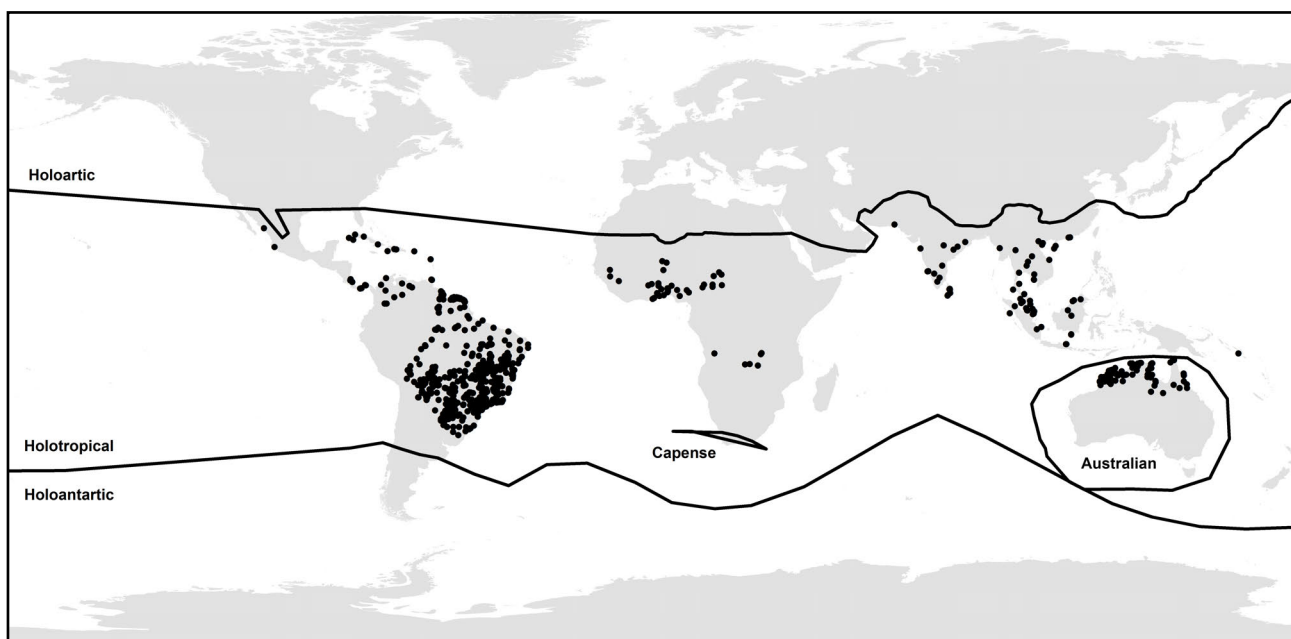


Figura 1. Mapa de distribuição de *Microstachys* nos reinos fitogeográficos de Takhtajan (1986).

Microstachys foi estabelecido por JUSSIEU (1824) com base em três espécies originalmente descritas em *Tragia* L. O nome tem origem no grego *μικροσταχυς* (eixo pequeno), em referência às suas inflorescências espiciformes (JUSSIEU, 1824; GLEDHILL, 2008). MÜLLER (1866, 1874) e PAX & HOFFMANN (1912) trataram *Microstachys* como seção de *Sebastiania* Spreng. Mais tarde, WEBSTER (1994) observou que espécies dessa seção eram marcadamente diferentes das outras seções de *Sebastiania*, representando possivelmente um gênero distinto. ESSER (1998) restabeleceu o gênero, nele incluindo as seguintes seções de *Sebastiania*: *Elachocroton* (F. Mull.) Pax, *Microstachys*, e *Microstachyopsis* (Müll. Arg.) Pax.

O gênero *Microstachys* é facilmente reconhecido por seu hábito herbáceo a subarbusivo, margem das folhas com numerosos denticulos ou estes nulos, inflorescências opostas às folhas, ovários e frutos com cornículos e sementes com carúncula (ESSER, 2001; 2012). Maiores detalhes sobre o gênero, bem como sua relação filogenética com gêneros próximos, e sua completa revisão taxonômica são vistos em capítulos subsequentes.

MOTIVAÇÕES PARA O ESTUDO DO GRUPO E ESTABELECIMENTO DO PROJETO DE PESQUISA

A grande diversidade de Euphorbiaceae *s. str.*, principalmente no Brasil, onde ocorre em praticamente todas as formações vegetais, aliado à grande variabilidade morfológica de suas espécies, faz desta família um grande desafio taxonômico. Embora o esforço para o conhecimento e compreensão dos gêneros da tribo Hippomaneae (p. ex. ESSER 2012) tenha aumentado, ela é relativamente pouco conhecida se comparada às demais tribos da família Euphorbiaceae. Apesar de ESSER (2001) ter contribuído para a circunscrição da tribo Hippomaneae, as hipóteses de relações filogenéticas entre os gêneros não se sustentaram com os dados obtidos por WURDACK *et al.* (2005), onde gêneros posicionados em outras tribos emergiram em meio às Hippomaneae. A tribo provavelmente contém uma diversidade bem maior do que a conhecida, pois muitos dos seus gêneros nunca foram revisados. *Microstachys* integra este conjunto e, deste sua circunscrição quando ainda seção de *Sebastiania* (por PAX & HOFFMANN, 1912), nunca foi revisado completamente, e as contribuições para o gênero desde 1912 foram de novas espécies e combinações (LANJOUW, 1939; CORDEIRO, 1989; SILVA & ESSER 2011), além do seu reestabelecimento por ESSER (1998).

OBJETIVOS

Esta tese de doutorado teve os seguintes objetivos:

- Realizar a revisão taxonômica e a inferência de uma filogenia baseada em dados moleculares para *Microstachys*.
- Reavaliar os caracteres diagnósticos empregados para a circunscrição de suas espécies
- Esclarecer as relações filogenéticas entre as espécies de *Microstachys* com os gêneros *Gymnanthes*, *Mabea* e *Sebastiania* da tribo Hippomaneae;
- Ampliar o conhecimento sobre a família Euphorbiaceae e fornecer dados para a conservação da biodiversidade.

ORGANIZAÇÃO DA TESE

A fim de facilitar o processo de publicação, além da Introdução Geral e das Considerações Finais, esta tese está apresentada em capítulos. As propostas nomenclaturais apresentadas somente serão válidas na publicação do(s) respectivo(s) artigo(s).

Capítulo 1: REVISION OF THE NEOTROPICAL SPECIES OF *MICROSTACHYS* (EUPHORBIACEAE – HIPPOMANEAE).

Neste capítulo é apresentada a revisão das espécies neotropicais do gênero *Microstachys*. O tratamento taxonômico inclui descrições morfológicas, citação do material-tipo, sinonímias, observações sobre habitat e fenofases, comentários sobre variabilidade morfológica e taxonomia, distribuição geográfica e ilustrações de caracteres diagnósticos.

Foram realizadas expedições nas localidades atualmente conhecidas para as espécies, para coleta de amostras para enriquecimento das coleções, estudos morfológicos, extração de DNA, observação da variabilidade morfológica das populações naturais, reconhecimento da vegetação em que ocorrem as espécies e registros fotográficos. O material coletado foi herborizado segundo técnicas tradicionais e incluído no Herbário SP, no Instituto de Botânica, com duplicatas enviadas a vários herbários.

Além da observação de populações naturais das espécies pertencentes a cada um dos grupos a serem estudados, o levantamento dos dados morfológicos foi realizado a partir da análise de coleções dos acervos dos principais herbários brasileiros através de visitas ou solicitação de empréstimo de espécimes. Também foram consultadas as coleções de alguns herbários europeus e norte-americanos, que se destacam por possuírem grandes acervos com importantes materiais-tipo.

Tanto para o capítulo 1 como no capítulo 2, o exame dos tipos ou imagens dos mesmos (imagens consultadas através dos sites dos herbários e de <http://plants.jstor.org/>), bem como a análise das descrições originais, foram os principais instrumentos para a circunscrição das espécies. Para o capítulo 1, a observação da variabilidade morfológica de caracteres selecionados nas populações das espécies no campo esteve associada com o exame dos tipos e análise das descrições originais.

Também para ambos os capítulos, para a padronização dos termos morfológicos nas chaves de identificação e descrições, foram utilizados os glossários de GONÇALVES & LORENZI (2011), HARRIS & HARRIS (2001), STEARN (2004).

Capítulo 2: TAXONOMIC REVISION OF EXTRA-AMERICAN *MICROSTACHYS* (EUPHORBIACEAE – HIPPOMANEAE).

Neste capítulo é apresentada a revisão das espécies de distribuição Paleotropical e Australiana do gênero *Microstachys*. O estudo taxonômico é apresentado com detalhadas descrições morfológicas, chaves de identificação, ilustrações e mapas de distribuição geográfica. Foram consultados espécimes dos herbários europeus, asiáticos e australianos.

Capítulo 3: MOLECULAR PHYLOGENY OF *MICROSTACHYS* (EUPHORBIACEAE, HIPPOMANEAE) AND ALLIED TAXA INFERRED FROM nrDNA AND cpDNA MARKERS.

Neste capítulo a filogenia molecular de *Microstachys* e seus gêneros correlatos na tribo Hippomaneae é tratada. São apresentadas análises filogenéticas realizadas com base em dados moleculares obtidos de marcadores candidatos a DNA barcoding e aqueles que forneceriam dados interessantes na resolução de filogenias na família Euphorbiaceae. O DNA foi extraído com êxito no Laboratório de Biologia Molecular do Instituto de Botânica de São Paulo, coordenado pelas Dra. Mutue Toyota Fujii e Dra. Clarice Palma da Silva. Os dados moleculares foram obtidos e analisados neste laboratório.

Capítulo 4: LECTOTYPIFICATIONS IN THE GENUS *MICROSTACHYS* (EUPHORBIACEAE).

Neste capítulo a história nomenclatural e os lectótipos dos nomes associados às espécies do gênero *Microstachys* são apresentados.

Capítulo 5: A NEW SPECIES OF *MICROSTACHYS* (EUPHORBIACEAE) IN PARAGUAY.

Neste capítulo é apresentada uma nova espécie para o Paraguay.

Capítulo 6: A NEW SPECIES AND TWO NEW COMBINATIONS IN *MICROSTACHYS* (EUPHORBIACEAE) FROM BRAZIL.

Neste capítulo é apresentada uma nova espécie endêmica para a Chapada dos Veadeiros, Goiás, Brasil.

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CAPÍTULO 1

A ser submetido à revista *Phytotaxa* (normas em Anexo 1).

Revision of the Neotropical species of *Microstachys*
(Euphorbiaceae – Hippomaneae)

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ABSTRACT

A taxonomic revision of the Neotropical species of *Microstachys* is presented. This hippomanean genus occurs in grasslands of the tropics worldwide, but its center of diversity is located in cerrado and caatinga provinces in Brazil. From the 19 neotropical species here recognized, four are widely distributed throughout South America, one of them reaches Antilles, Central America and Mexico, six have more restricted distribution within Brazil and neighboring countries and nine are endemic to small areas of Brazil or Paraguay. Key for the species, descriptions, illustrations and distribution maps are presented.

Keywords: Hippomaneae, *Sebastiania*, Taxonomy

INTRODUCTION

Microstachys A. Juss. (Euphorbiaceae) is a subshrub genus from grasslands of the tropics worldwide (Esser 1998, 2012) and is one of the largest genera of the tribe Hippomaneae. Hippomaneae is a pantropical tribe, with few extratropical species, the second largest one of Euphorbiaceae, subfamily Euphorbioideae, with 33 genera and around 300 species. Most of them are woody plants and few are herbs or shrubs, mainly latescent; characterized by elongate or glomerulate thyrsal inflorescences, with pistillate flowers at the base and numerous staminate cymules apically, bracts glandular to rarely eglandular (Esser 2001, 2012).

Jussieu (1824) created the genus *Microstachys*, which along *Excoecaria*, *Hippomane*, *Sapium*, *Sebastiania* and *Stillingia* composed his Section V – tribe Hippomaneae. Although recognizing *Microstachys* as a genus (Müller 1863), Müller (1866) changed his mind and treated it as *Sebastiania* sect. *Microstachys*. This circumscription was maintained by Müller (1874) and accepted by Pax (1912). Webster (1994) noted the morphological differences between the species of this section and other *Sebastiania* and commented on the possibility of recognizing it as a genus. Esser (1994) accepted this view and also synonymized under *Microstachys* two other sections of *Sebastiania*: sect. *Elachocroton* (F. Muell.) Pax and sect. *Microstachyopsis* (Müll.Arg.) Pax and afterwards proposed some new combinations in *Microstachys* (Esser 1998).

Esser (2001) believed that *Microstachys* is a monophyletic genus clearly distinct in the tribe, by a subshrubby habit, simple and alternate leaves with serrulate margins, rarely entire, spiciform inflorescences opposite to the leaves, ovaries and fruits with spiny appendages, and seeds with a stipitate disc-shaped caruncle (Esser 2001, 2012).

The latest complete revision of the tribe Hippomaneae, including the genus *Microstachys* as a section of the *Sebastiania* s.l. along with sect. *Elachocroton* (F. Muell.) Pax and sect. *Microstachyopsis* (Müll.Arg.) Pax, was conducted by Pax & Hofmann (1912). Many collections of *Microstachys* were identified at the herbaria and local flora checklists with its names under *Sebastiania*.

MATERIALS AND METHODS

Collections of the following herbaria were consulted: B, BR, BHCB, BM, BOTU, C, DNA, E, ESA, F, G, GH, GOET, HB, HBG, IBGE, IAC, K, L, M, MBM, MO, MPU, NY, P, PAMG, PERTH, PMSP, OUPR, R, RB, S, SESJ, SP, SPF, SPSF, TCD, U, UEC, UFG, US, W. The collection made by the authors, based on field expeditions, are deposited at herbarium SP and M. Abbreviations are according to Thiers (2013, continuously updated).

The measurements of the floral parts were obtained from alcohol fixed material and herbarium material rehydrated in boiling water. The measurements of lengths and widths were obtained from the largest and smallest axes found on any individual sample. The species descriptions adopted the morphological nomenclature of Beentje (2012), Harris & Harris (2001) and Stearn (2004).

The species are arranged in alphabetical order, with description, distribution notes, habitat, IUCN conservation assessment and additional specimens examined. A list of collectors is given at the end. The conservation status is according the IUCN red list rank (IUCN 2001).

The synonyms were proposed based on analysis of the original descriptions, type specimens or type images, additional collections as well as observation of populations. The type specimens (or images of types available in JStor) of *Microstachys* that have been examined for this study are followed by a “!”.

The distribution and ecological comments were based on field observations and herbaria label information. The collections were databased using BRAHMS (Filer 2009). QGIS (<http://qgis.osgeo.org/>) was used to make the distribution map using Morrone (2014) phytogeographic provinces.

TAXONOMIC TREATMENT

Microstachys Jussieu (1824: 48)

Type: *Microstachys bicornis* Jussieu (1825: t. 15)

= *Microstachys corniculata* (Vahl 1798: 55) Grisebach (1864: 49)] ≡ *Sebastiania* Spreng. sect. *Microstachys* (A.Juss.) Müller Argoviensis (1866: 1166).

= *Cnemidostachys* Martius & Zuccarini (1824a: 136) – Lectotype (designated by Esser 1998): *Cnemidostachys myrtilloides* Martius & Zuccarini (1824a: 137) [= *Microstachys daphnoides* (Mart. & Zucc.) Müller Argoviensis 1863: 91]] ≡ *Sebastiania* Spreng. sect. *Cnemidostachys* (Mart. & Zucc.) Webster (1967: 38).

= *Elachocroton* Mueller (1857: 17). Type: *Elachocroton asperococcus* Mueller (1857: 17) [= *Microstachys chamaelea* (Linnaeus 1753: 981) Müller Argoviensis (1863: 95)] ≡ *Sebastiania* Spreng. sect. *Elachocroton* (F.Muell.) Pax & Hoffmann (1912: 114).

= *Tragiopsis* Karsten (1859: 5) – Type: *Tragiopsis fruticulosa* H.Karst. [= *Microstachys corniculata* (Vahl) Griseb.].

= *Stillingia* Garden ex L. sect. *Microstachyopsis* (A.Juss.) Müller Argoviensis (1863: 89) – Type: *Stillingia heterodoxa* Müller Argoviensis [= *Microstachys heterodoxa* (Müll.Arg.) Esser] ≡ *Sebastiania* Spreng. sect. *Microstachyopsis* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 118).

Monoecious subshrubs to shrubs. Stems erect to decumbent, herbaceous, woody and rarely carnose, caespitose to single, glabrous to pubescent. Indumentum of unbranched filiform or rarely dentritic (*M. heterodoxa*) multicellular hairs. **Leaves** alternate, petiolate, concolor to discolor; blade chartaceous to membranous (or carnose in *M. liliputiana*), glabrous to pubescent, brochidodromous to hyphodromous, with marginal to submarginal glands, margin serrulate to serrate, denticles adpressed to inclined; stipules acuminate to ovate, glabrous to pubescent. **Inflorescence** a spiciform thyrsus, leaf-opposite, axis glabrous to pubescent, with numerous staminate cymules distally and 1-3 pistillate cymule proximally, distichously or spiralate arranged; bracts glandular, apex acuminate, margin entire to lacerate. **Staminate flower** 1-3 per cymule; sepals 3, acuminate, eglandular; petals 0; stamens 3. **Pistillate flower** 1 per cymule; sepals 3, acuminate, eglandular to glandular; petals 0; ovary 3-carpelar, globose, with conic appendages, rarely smooth, glabrous to pubescent; stigmas 3, cylindric to globose, free to slightly connate at the base. **Fruit** oblong to globose, glabrous to pubescent, septicid-loculid; pericarp dry; sepals persistent (to non-persistent), stigmas persistent (to non-

persistent); with spine appendages on each mericarp; 3-quetrous columella persistent, apically alate. **Seed** oblong (to rarely globose), testa spotted or non-spotted, dry; aril 0; caruncle stipitate, disc-shaped.

Among the 19 Neotropical species of the genus most of them occurs in northeast and southern Brazil, four are distributed throughout South America, and one reaching Antilles, Central America and Mexico. These species occurs in 26 of the 53 Neotropical Morrone's provinces (2014) (Fig. 1, Table 1).

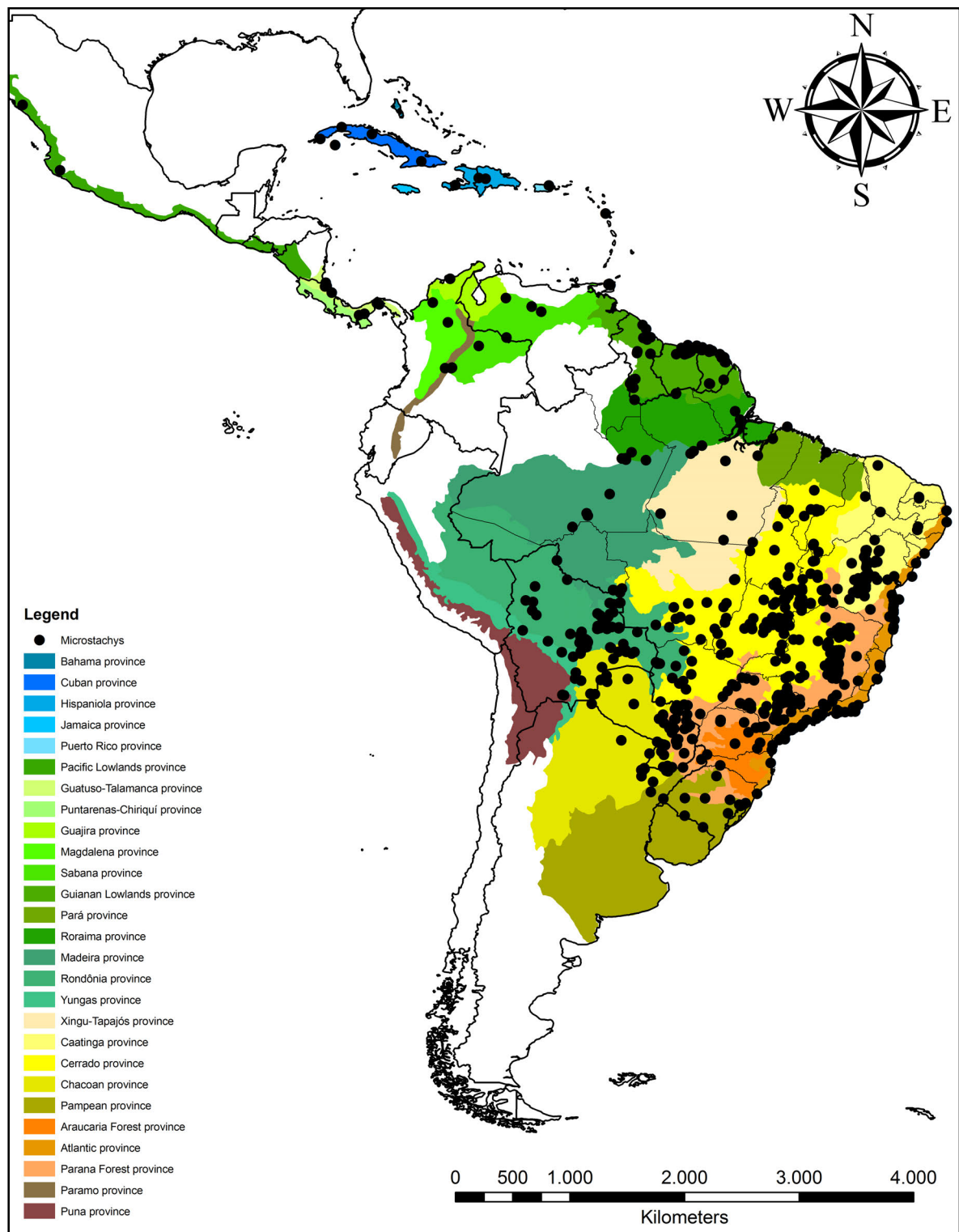


Figure 1. Distribution of *Microstachys* and the neotropics provinces with species¹.

¹ The whitish areas have absence of *Microstachys*.

Table 1. Distribution of Neotropical species of *Microstachys*.

Distribution	Species	Occurrence Area	Morrone's 2014 Provinces ²	Habitat in Brazil
1. Wide	<i>M. bidentata</i>	Bolivia, Brazil (AM, BA, DF, GO, MA, MT, MG, PA, SP, TO),	ATL, CAA, CER, CHA, GUL,	Cerrado s. str.,
		French Guiana, Paraguay, Venezuela	MAD, PRF, RON, SAB	Campo rupestre
	<i>M. corniculata</i>	Argentina, Bolivia, Brazil (AM, BA, CE, DF, ES, GO, MA, MT,	ATL, CAA, CER, CHA, CUB,	Restinga, Cerrado s. str.
		MS, MG, PA, PB, PR, PE, PI, RJ, RN, RS, RR, SC, SP, SE, TO),	GUA, GUT, GUL, HSP, LAN,	
		Colombia, Costa Rica, Cuba, Dominican Republic, Guyana, Haiti,	MAG, PFL, MAD, PAR, PRM,	
2. Restricted	<i>M. salicifolia</i>	French Guiana, Mexico, Panama, Paraguay, Peru, Puerto Rico,	PRF, PRC, PUC, ROD, ROR,	s.lat., Campo rupestre
		Suriname, Trinidad & Tobago, Venezuela	SAB, TRI, XIT	
		Argentina, Bolivia, Brazil (AP, AM, BA, CE, ES, GO, MT, MS,	ATL, CAA, CER, CHA, GUL,	
		MG, PA, PI, RJ, SP, TO), Colombia, French Guiana, Guyana,	MAD, PAR, PRF, RON, ROR,	
		Paraguay, Suriname, Venezuela	SAB, XIT	
2. Restricted	<i>M. crotonoides</i>	Argentina, Bolivia, Brazil (BA, ES, GO, MA, MT, MS, MG, PA,	ATL, ARF, CAA, CER, CHA,	Cerrado s. str.
		PR, RS, RJ, SP), Paraguay.	PAM, PAR, PRF, RON, YUN	
	<i>M. daphnoides</i>	Brazil (BA, ES, GO, MG, RJ, SP)	ATL, CAA, CER, PRF	Campo rupestre
2. Restricted	<i>M. ditassoides</i>	Bolivia, Brazil (BA, DF, GO, MT, MS, MG, PI)	CAA, CER, CHA	Cerrado s. str., Campo rupestre

² ARF (*Araucaria* Forest), ATL (Atlantic), CAA (Caatinga), CER (Cerrado), CHA (Chacoan), CUB (Cuban), GUA (Guajira), GUL (Guianan Lowlands), GUT (Guatuso-Talamanca), JAM (Jamaica), LAN (Lesser Antilles), MAD (Madeira), MAG (Magdalena), PAM (Pampean), PAR (Pará), PFL (Pacific Lowlands), PRC (Puerto Rico), PRF (Parana Forest), PRM (Paramo), PUC (Puntarenas-Chiriqui), PUN (Puna), RON (Rondonia), ROR (Roraima), SAB (Sabana), TRI (Trinidad), XIT (Xingu-Tapajós), YUN (Yungas).

Distribution	Species	Occurrence Area	Morrone's 2014 Provinces ²	Habitat in Brazil
	<i>M. glandulosa</i>	Brazil (BA, ES, GO, MT, MS, MG, PI, RJ, SP)	ATL, CER, PRF	Campo rupestre, Restinga
	<i>M. hispida</i>	Argentina, Bolivia, Brazil (BA, DF, GO, MT, MS, MG, PR, PE, SC, SP, RS), Paraguay	ATL, ARF, CAA, CER, CHA, PAM, PRF, RON, YUN	Cerrado s.lat., Campo rupestre
	<i>M. marginata</i>	Brazil (BA, MG)	CAA, CER	Cerrado s. str.
	<i>M. serrulata</i>	Argentina, Bolivia, Brazil (DF, GO, MT, MS, MG, PR, RS, SP), Paraguay	CER, CHA, PRF, RON, YUN	Cerrado s.lat., Campo rupestre
3. Endemic	<i>M. anisodonta</i>	Brazil (GO)	CER	Campo rupestre
	<i>M. dasycarpa</i>	Paraguay	CHA	Cerrado s. str.
	<i>M. heterodoxa</i>	Brazil (BA)	ATL, CAA	Campo rupestre, Restinga
	<i>M. liliputiana</i>	Brazil (GO)	CER	Campo rupestre
	<i>M. nana</i>	Brazil (PR)	ARF	Cerrado s. str.
	<i>M. nummularifolia</i>	Brazil (MG)	CER	Campo rupestre
	<i>M. revoluta</i>	Brazil (BA)	CAA	Campo rupestre
	<i>M. stipulacea</i>	Brazil (RS), Uruguay	PAM	Steppes
	<i>M. uleana</i>	Brazil (BA)	CAA	Campo rupestre

Key to the neotropical species of *Microstachys*

- 1 Leaf blade carnose *M. liliputiana*
- Leaf blade membranaceous, chartaceous or coriaceous 2
- 2 Leaf blade coriaceous, margin thickened 3
- Leaf blade membranaceous or chartaceous, margin not thickened 4
- 3 Leaf margin serrulate-repand, fruit with inconspicuous nodiform appendages and persistent stigmas, styles free, seed testa spotted *M. uleana*
- Leaf margin entire, fruit with horn-shaped appendages and non-persistent stigmas, styles connate at base, seed testa not spotted *M. marginata*
- 4 Margins revolute, entire 5
- Margins plane, serrate or serrulate 6
- 5 Plant without xylopodium, inflorescence cylindric, cymules spirally arranged, ovary glabrous *M. revoluta*
- Plant with xylopodium, inflorescence flattened, cymules distichously arranged, ovary pubescent *M. ditassoides*
- 6 Margin serrate 7
- Margin serrulate 8
- 7 Habit decumbent, flowers and fruits sessile, fruit with nodiform appendages
..... *M. anisodonta*
- Habit erect, flowers and fruits pedicellate, fruit with horn-shaped appendages
..... *M. serrulata*
- 8 Leaf linear, stigma globose, fruit with nodiform appendages 9
- Leaf lanceolate, ovate, elliptic or other, stigma cylindric, fruit with horn-shaped or auriculate appendages 10
- 9 Ovary and fruit tomentose *M. dasycarpa*
- Ovary and fruit glabrous *M. bidentata*
- 10 Ovary and fruit hispid *M. hispida*
- Ovary and fruit glabrous to pubescent 11

11	Indument floccose with dendritic hairs.....	<i>M. heterodoxa</i>
-	Indument glabrous to pubescent with filiform hairs	12
12	Pistillate flower with connate stigmas	13
-	Pistillate flower with free stigmas	14
13	Elliptic leaves with 2 pairs of crateriform reddish glands at the base, brochidodromous, ovary glabrous, with auriculate appendages	<i>M. nana</i>
-	Orbicular leaves without glands, hyphodromous, ovary puberulent, horn-shaped appendages	<i>M. nummularifolia</i>
14	Leaf discolor, inflorescence puberulous	<i>M. daphnoides</i>
-	Leaf concolor, inflorescence glabrous or pubescent.....	15
15	Leaf with subcordate to cordate base, membranaceous.....	<i>M. corniculata</i>
-	Leaf with rounded to obtuse base, chartaceous	16
16	Stipules linear, petiole conspicuous	<i>M. stipulacea</i>
-	Stipules ovate to acuminate, petiole inconspicuous	17
17	Leaf with acute-falcate apex, bracts with sessile glands, pistillate flower subsessile	<i>M. salicifolia</i>
-	Leaf with acute to obtuse apex, bracts with stipitate glands, pistillate flower pedicellate	18
18	Plant with xylopodium, leaf ovate, pistillate sepals with rounded apex, fruit globose with numerous appendages, seed with smooth testa	<i>M. glandulosa</i>
-	Plant without xylopodium, leaf elliptic to lanceolate, pistillate sepals with a retuse apex, fruit oblong with 1 pair of appendages on each mericarp, seed with spotted testa	<i>M. crotonoides</i>

***Microstachys anisodonta* (Müller Argoviensis) M.J. Silva, Pscheidt & Cordeiro comb. nov. ined.**

(Fig. 2 A-E)

≡ *Sebastiania anisodonta* Müller Argoviensis (1874: 550) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Goiás, Serra D'Ourada, without date, *Pohl 1555* (M!; isolecto: W!).

Subshrubs 10-100 cm tall, without xylopodium, decumbent. Branches pilose, hairs ca. 0.5 mm long. **Leaves** concolor; petiole 1 mm long, pubescent, hairs ca. 0.5 mm long; blade ovate, 0.5-2 × 0.2-1 cm, chartaceous, pilose, hairs ca. 0.8 mm long, brochidodromous, 1-2(-8) pairs of marginal crateriform glands, 0.1 mm in diameter, base obtuse, margin serrate, plane, denticles inclined, 0.5 mm long, apex acute; stipules ovate, 0.5 × 0.5 mm, glabrous. Inflorescence 0.5-3 cm long, axis pilose, hairs ca. 0.8 mm long; bracts 0.5 × 0.5 mm, basal stipitate glands 0.2 mm in diameter, margin entire, pistillate cymule 1. **Staminate flower** 1, sessile; sepals 0.5 × 0.3 mm, apex rounded; stamens 0.3 mm long, anthers 0.1 mm long. **Pistillate flower** sessile; sepals 0.5 × 0.5 mm, eglandular, apex rounded; ovary 0.6 × 0.6 mm, ornate, glabrous; stigmas 1 mm long, free. Fruit oblong, 0.5 × 0.3 cm, glabrous, sessile; sepals persistent, stigmas persistent; numerous nodiform appendages into two bands on each mericarp, ca. 0.2 mm long; columella 1.5 mm long. **Seed** oblong, 2 × 1 mm, testa non-spotted.

Distribution and habitat: — *Microstachys anisodonta* is endemic to Goiás and occurs in campos rupestres in cerrado phytogeographic province (Fig 3, Table 1).

IUCN conservation assessment: — Critically Endangered (CR) due to its very small population with restricted area of occurrence.

Morphological notes: — *Microstachys anisodonta* has serrate leaf margins as *Microstachys serrulata*, but with smaller teeth. Its decumbent habit also differs from *M. serrulata*, that has erect habit.

Additional specimens examined: — BRAZIL. Goiás: Alto Paraíso de Goiás, 8 February 1987, *Neto, S.R. 613 et al.* (SP); Goiás: Chapada dos Veadeiros, 14 February 1966, *Irwin, H.S. 12846 et al.* (NY, SP); Goiás: Pirenópolis, 15°49'58" S, 48°58'22" W, 28 November 2002, *Fonseca, M.L. 3870 et al.* (IBGE, SP); Goiás: Pouso Alto, 13°57'45" S, 47°30'02" W, 21 January 2012, *Pscheidt, A.C. 123 et al.* (SP).

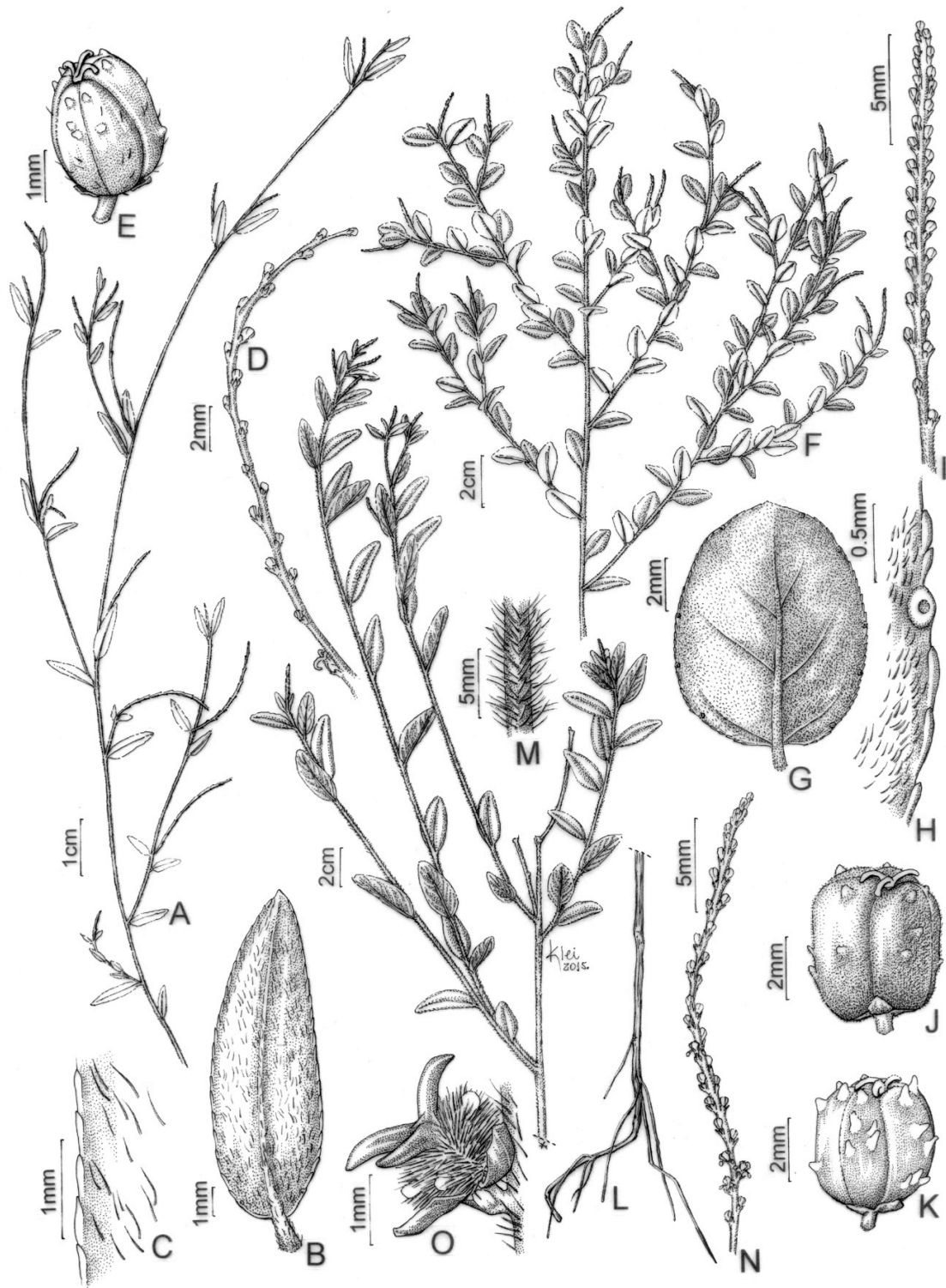


Figure 2. *Microstachys anisodonta*. A. Habit. B. Leaf. C. Margin of the leaf. D. Inflorescence. E. Fruit. (H.S. Irwin et al. 12846). *Microstachys glandulosa*. F. Habit. G. Leaf. H. Margin of the leaf with gland. I. Inflorescence. J. Fruit. K. Fruit. (O.L.M. Silva et al. 154). *Microstachys hispida*. L. Habit. M. Indument. N. Inflorescence. O. Pistillate flower. (A.C. Pscheidt et al. 62).

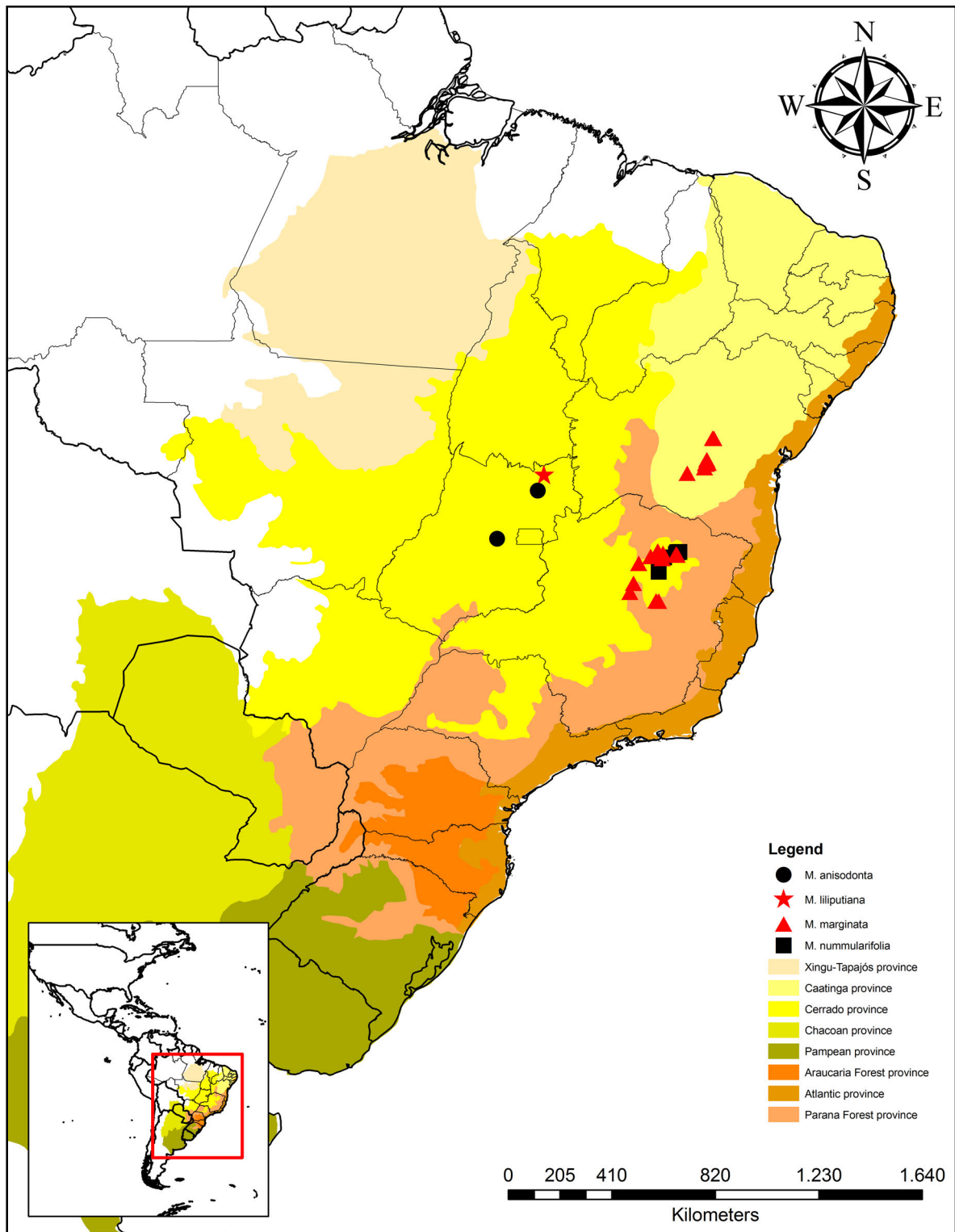


Figure 3. Distribution map of *Microstachys anisodonta*, *M. liliputiana*, *M. marginata* and *M. nummularifolia*.

***Microstachys bidentata* (Martius & Zuccarini) Esser (1999: 958)**

(Fig. 4 A-I, 5)

- ≡ *Cnemidostachys bidentata* Martius & Zuccarini (1824: 137) ≡ *Microstachys virgata* Müller Argoviensis (1863: 94) ≡ *Microstachys virgata* var. *bidentata* (Mart. & Zucc.) Müller Argoviensis (1863: 94) ≡ *Stillingia bidentata* (Mart. & Zucc.) Baillon (1865: 324) ≡ *Sebastiania virgata* (Müll.Arg.) Müller Argoviensis (1866: 1173) ≡ *Sebastiania virgata* var. *bidentata* (Mart. & Zucc.) Müller Argoviensis (1866: 1174) ≡ *Sebastiania bidentata* (Mart. & Zucc.) Pax, Pax & Hoffmann (1912: 113) – Type specimen: BRAZIL. Minas Gerais, Ouro Preto, without date, *Martius s.n.* (holo: M!; iso: K!, L!, M!).
- = *Cnemidostachys scoparia* Martius & Zuccarini (1824a: 137, 1824b: 70) ≡ *Microstachys virgata* var. *scoparia* (Mart. & Zucc.) Müller Argoviensis (1863: 94) ≡ *Sebastiania virgata* var. *scoparia* (Mart. & Zucc.) Müller Argoviensis (1866: 1174) ≡ *Sebastiania bidentata* var. *scoparia* (Mart. & Zucc.) Pax, Pax & Hoffmann (1912: 114) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Minas Gerais, “in campis montanis”, without date, *Martius s.n.* (M!).
- = *Microstachys virgata* var. *odontococca* Müller Argoviensis (1863: 94) ≡ *Sebastiania virgata* var. *odontococca* Müller Argoviensis (1866: 1173) ≡ *Sebastiania bidentata* var. *odontococca* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 113) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Without gazetteer and date, *Sellow s.n.* (K!).
- = *Sebastiania bidentata* var. *pilgeri* Pax & Hoffmann (1912: 113) – Type specimen: BRAZIL. Mato Grosso “Serradão bei Cuyabá”, 1899, *Pilger 813* (holo: B!).

Subshrub 30-100 cm tall, with xylopodium, caespitose. Branches glabrous. **Leaves** concolor; petiole 0.5-1 mm long, glabrous; blade linear, 1.5-9.5 × 0.05-0.6 cm, chartaceous, glabrous, hyphodromous, 1 pair of marginal crateriform gland, 0.5 mm in diameter, base attenuate, margin serrulate, plane, denticles adpressed, 0.2 mm long, apex acute; stipules ovate, 0.5-1 × 0.5-1 mm, pubescent. **Inflorescence** 1.5-5.5 cm long, axis glabrous; bracts 0.5 × 0.5 mm, sessile glands 0.3 mm in diameter, margin entire, pistillate cymule 1. **Staminate flower** 1, pedicellate, pedicel 0.2 mm long; sepals 0.5 × 0.5 mm, apex acuminate; stamens 0.2 mm long, anthers 0.3 mm long. **Pistillate flower** pedicellate, pedicel 0.4 mm long; sepals 1 × 1 mm, eglandular, apex acuminate; ovary 0.5 x 0.5 mm, ornate, glabrous; stigmas globose, 0.3 mm

long, free. **Fruit** oblong, 0.5-0.6 × 0.3-0.4 cm, glabrous, pedicellate, pedicel ca. 1 mm long; sepals persistent, stigmas persistent; 1 pair of nodiform appendages apically on each mericarp, ca. 0.2 mm long; columella ca. 0.5 mm long. **Seed** oblong, 3-4 × 1.5-2 mm, testa non-spotted, carunculate.

Distribution and habitat: — *Microstachys bidentata* is one of the five widely distributed species of the genus, occurring throughout South America in ten phytogeographic provinces at elevations of 400–1,496 m, in campos rupestres and cerrados. (Fig. 6, Table 1).

IUCN conservation assessment: — Least concern (LC): *M. bidentata* is widespread and abundant throughout South America, occurring also in protected areas.

Nomenclatural notes: — Martius & Zuccarini (1824a, 1824b) described *Cnemidostachys bidentata* and *C. scoparia*. Both the types are very similar and comprise the morphological variation observed in its populations.

Morphological notes: — *Microstachys bidentata* shows linear and long leaves as some specimens of *M. salicifolia*. However, *M. bidentata* has pistillate flowers with globose and dilated stigmas whereas *M. salicifolia* has long cylindrical stigmas.

Additional specimens examined: — **BOLIVIA.** Beni: Ballivan, 15 August 1985, Beck, S.G. 5661 (M, MO); La Paz: Iturralde, 13°05' S, 67°15' W, 19 March 1984, Haase, R. 334 (M); La Paz: Iturralde, 13°05' S, 67°15' W, 5 September 1984, Haase, R. 521 (M); Santa Cruz: Velasco, 14°44'19" S, 61°00'17" W, 19 May 1994, Guillén, R. 1384 (MO).

BRAZIL. Amazonas: Humaitá, 7°31' S, 63°10' W, 11 May 1980, Janssen, A. 367 (M); Amazonas: Manicoré, 7°40' S, 61°10' W, 24 April 1985, Ferreira, C.A.C. 5801 (K); Bahia: Agua Quente, 13°31' S, 42°00' W, 15 December 1988, Harley, R.M. 27187 (K); Bahia: Barreiras, 12°04'19" S, 45°36'19" W, 2 November 1987, Queiroz, L.P. 2100 (HUEFS, SP); Bahia: Caetité, 18 February 1992, Carvalho, A.M.V. 3689 *et al.* (CEPEC, SP); Bahia: Correntina, 13°29' S, 44°43' W, 25 April 1980, Harley, R.M. 21767 (K); Bahia: Espigão Mestre, 3 March 1972, Anderson, W.R. 36519 (K); Bahia: Formosa do Rio Preto, 11°12'33" S, 45°28'36" W, 22 April 1998, Azevedo, M.L.M. 1318 *et al.* (IBGE, SP); Bahia: Mucugê, 13°06' S, 41°22' W, 25 March 1980, Harley, R.M. 20961 (K); Bahia: Piatã, 13°02' S, 41°53' W, 19 January 2006, Conceição, A.A. 1683 *et al.* (SP); Bahia: Rio Piau, 12 April 1966, Irwin, H.S. 14659 *et al.* (NY, SP); Bahia: Seabra, 24 February 1971, Irwin, H.S. 30974 (K); Bahia: São Desidério, 10 April 1989, Scariot, A.O. 523 (P); Bahia: São Inácio, 24 February 1977, Harley, R.M. 19015 (P); Bahia: Água Quente, 13°31' S, 42°00' W, 15 December 1988, Harley, R.M. 27187 *et al.* (CEPEC, IBUSP, K, SP, SPF); Distrito Federal: Chapada da Contagem, 17 December 1965, Irwin, H.S. 11351 *et al.* (NY, SP); Distrito Federal: Brasília, 31 December 1974, Heringer, E.P. 14330 (K); Distrito Federal:

Sobradinho, 2 February 1990, *Arbo*, M.M. 3421 (K); **Goias: Teresina de Goias**, 13°51'33" S, 47°16'26" W, 15 January 2013, *Francener*, A. 1258 *et al.* (SP); **Goias: Alto Paraíso de Goias**, 4 February 1990, *Arbo*, M.M. 3632 (K); **Goias: Alvorada do Norte**, 14°30'45" S, 46°33'19" W, 18 February 2003, *Mendonça*, R.C. 5227 *et al.* (IBGE, SP); **Goias: Campo Alegre de Goias**, 30 January 1990, *Arbo*, M.M. 3115 (K); **Goias: Catalão**, 24 January 1970, *Irwin*, H.S. 25271 (K); **Goias: Cavalcante**, 7 March 1969, *Irwin*, H.S. 23995 (K, P); **Goias: Chapada dos Veadeiros**, 15 February 1979, *Filgueiras*, T.S. 393 (P); **Goias: Chapadão do Céu**, 17°48' S, 52°39' W, 10 December 1998, *Batalha*, M.A. 2430 (SP); **Goias: Mambai**, 14°27'40" S, 46°07'07" W, 19 February 2003, *Fonseca*, M.L. 4153 *et al.* (IBGE, SP); **Goias: Pirenópolis**, 9 December 1987, *Meira Neto*, J.A.A. 20006 *et al.* (UEC); **Goias: Posse**, 14°03'06" S, 46°19'01" W, 8 March 2001, *Fonseca*, M.L. 2501 *et al.* (IBGE, SP); **Goias: Pouso Alto**, 13°57'53" S, 47°30'07" W, 21 January 2012, *Pscheidt*, A.C. 122 *et al.* (SP); **Goias: Rio Preto**, August 1912, *Lützelburg* 1448 (M); **Goias: São Domingos**, 13 May 2000, *Hatschbach*, G. 71031 *et al.* (Z); **Goias: São Jorge**, 14°09'48" S, 47°46'23" W, 19 January 2012, *Pscheidt*, A.C. 108 *et al.* (SP); **Goias: São João da Aliança**, 22 March 1973, *Anderson*, W.R. 7665 (K); **Goias: Veadeiros**, 13 March 1969, *Irwin*, H.S. 24285 (M); **Goias: Água fria**, 8 February 1994, *Hatschbach*, G. 60162 (K); **Maranhão: Balsas**, 8°36'00" S, 4°64'30" W, 20 November 1995, *Silva*, G.P. 3216 *et al.* (CEN, SP); **Maranhão: São Félix de Balsas**, 6°56' S, 46°01' W, 4 March 1970, *Eiten*, G. 10821 *et al.* (SP); **Mato Grosso: Aquidauana**, 25 January 1979, *Leitão-Filho*, H.F. 9290 (BM); **Mato Grosso: Balneário da Martinha**, 15°30'41" S, 55°24'11" W, 9 March 2013, *Francener*, A. 1314 *et al.* (SP); **Mato Grosso: Barra do Garças**, 6 May 1973, *Anderson*, W.R. 9848 (K); **Mato Grosso: Chapada dos Guimarães**, 15°24'19" S, 55°50'04" W, 28 February 2011, *Mota*, N.F.O. 2069 *et al.* (BHCB, SP); **Mato Grosso: Cuiaba**, 1899, *Pilger* 813 (B); **Mato Grosso: Cuiabá**, 15°30' S, 55°45' W, 21 October 1985, *Pirani*, J.R. 1306 (K); **Mato Grosso: Itiquira**, 17°33'35" S, 54°45'37" W, 1 November 2000, *Arbocz*, G.F. 7151 (SP); **Mato Grosso: Nova Xavantina**, 27 January 2000, *Viana*, R.H.O. 271 (NX, SP); **Mato Grosso: Serra do Roncador**, 25 May 1966, *Irwin*, H.S. 16040 *et al.* (NY, SP); **Mato Grosso: Tatuapé**, 16°47' S, 54°06' W, 7 November 1993, *Ratter*, J.A. 7019 (K); **Mato Grosso: Xavantina**, 31 August 1968, *Eiten*, G. 8483 (K); **Minas Gerais: Caldas**, 9 January 1919, *Hoehne*, F.C. s.n. (SP); **Minas Gerais: Diamantina**, 28 January 1986, *Cordeiro*, I. s.n. (K); **Minas Gerais: Formoso**, 15°22'17" S, 45°34'32" W, 19 May 1998, *Fonseca*, M.L. 1848 *et al.* (IBGE, SP); **Minas Gerais: Gouveia**, 7 February 1972, *Anderson*, W.R. 35592 (K); **Minas Gerais: Grão Mogol**, 16°34'24" S, 42°53'54" W, 23 June 2012, *Pscheidt*, A.C. 173 *et al.* (SP); **Minas Gerais: Jaboticatubas**, 16 February 1973, *Sazima*, M. 3849 *et al.* (SP); **Minas Gerais: Joaquim Felício**, 17°42' S, 44°18' W, 12

February 1988, *Pirani, J.R.* 2185 *et al.* (NY, SP, SPF); **Minas Gerais: Ouro Preto**, *Martius* s.n. (K, L, M); **Minas Gerais: Santana de Pirapama**, 19°00'22" S, 43°46'27" W, 10 November 2009, *Klitgaard, B.B.* 1184 *et al.* (SP, SPF); **Minas Gerais: Serra do Cipó**, November 1985, *Castro, N.M.* 540 (SP); **Minas Gerais: Uberava**, 12 December 1848, *Regnell, A.F.* 1057 (M); **Pará: Pratati**, 8°00' S, 57°50' W, 11 February 1974, *Anderson, W.R.* 10788 (K); **São Paulo: Araçoiaba da Serra**, 23°29'93" S, 47°37'53" W, 19 December 2012, *Silva, O.L.M.* 63 *et al.* (SP); **São Paulo: Campinas**, 12 December 1940, *Viegas, A.P.* 5945 *et al.* (IAC, SP); **São Paulo: Itapetininga**, 23°35' S, 47°58' W, 4 February 1965, *Eiten, G.* 5806 *et al.* (SP); **São Paulo: Itirapina**, 11 February 1993, *Barros, F.* 2650 (SP); **São Paulo: Mogi Mirim**, 18 November 1936, *Hoehne, L.C.* s.n. *et al.* (SP); **São Paulo: Mogi-Guaçu**, 22°10' S, 47°15' W, 6 February 1980, *Filho, A.C.* 227 (SP); **São Paulo: Pedregulho**, 20°14'52" S, 47°27'37" W, 15 February 2004, *Caruzo, M.B.R.* 36 *et al.* (SP); **São Paulo: Pirassununga**, 22°02' S, 47°30' W, 4 May 1994, *Batalha, M.A.* 96 *et al.* (SP); **Tocantins: Almas**, 11°06'09" S, 46°45'35" W, 6 July 2009, *Fonseca, M.L.* 6139 *et al.* (IBGE, SP); **Tocantins: São Salvador do Tocantins**, 12°48'12" S, 48°14'52" W, 21 February 2002, *Pereira-Silva, G.* 5935 *et al.* (CEN, SP).

PARAGUAY. Boquerón: Nueva Asuncion, 205414°00' S, 615046°00' W, 27 January 1995, *Zardini, E.M.* 42388 (M).

VENEZUELA. Apure: Rómulo Gallegos, 64851°00' N, 694041°00' W, 7 March 1979, *Davidse, G.* 16123 (P).

FRENCH GUIANA. San Martin: January 1856, *Triana, J.* 3667 (BM).

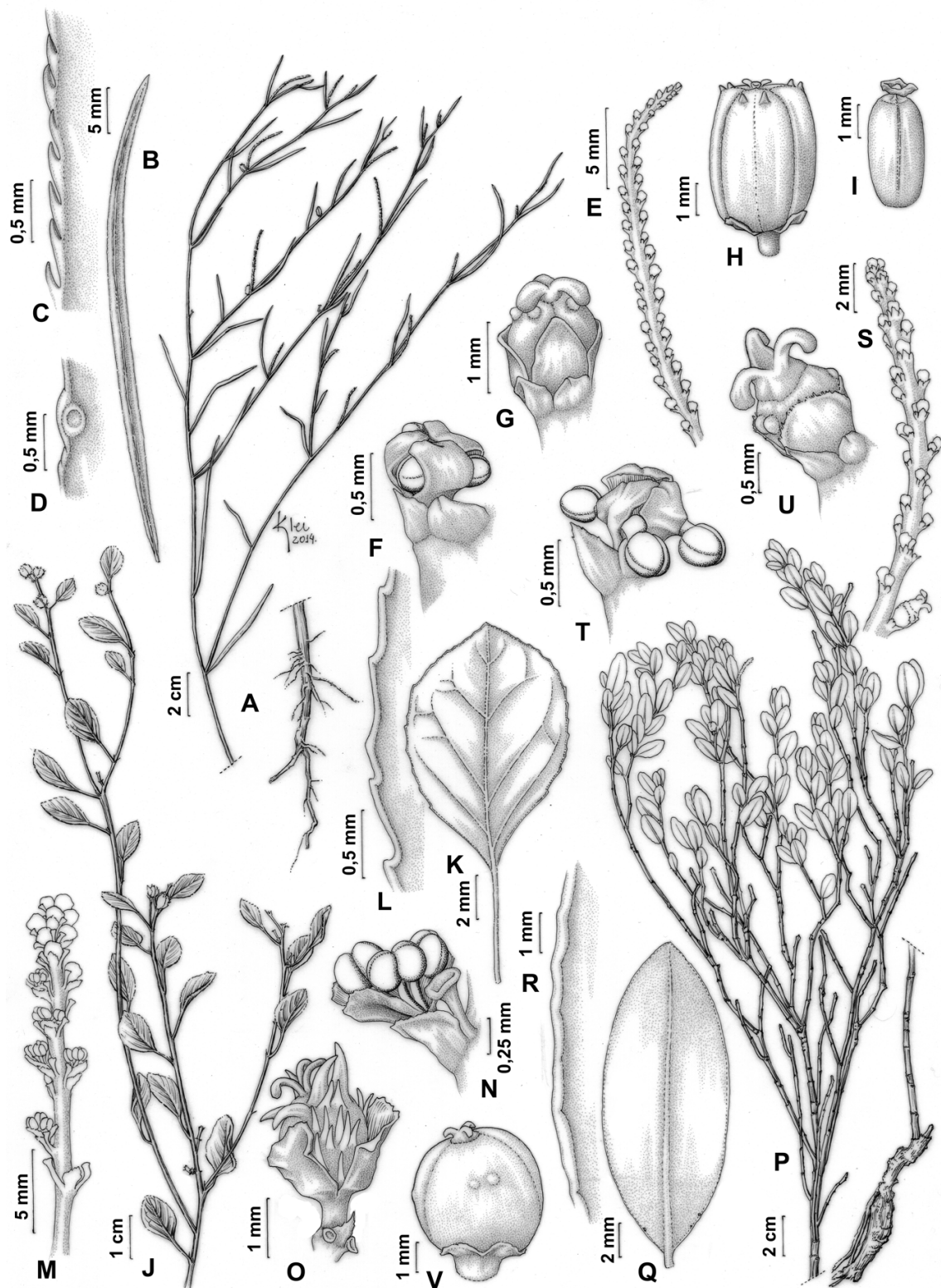


Figure 4. *Microstachys bidentata*. A. Habit. B. Leaf. C. Margin. D. Gland in the leaf margin. E. Inflorescence. F. Staminate flower. G. Pistillate flower. H. Fruit. I. Seed. (A.C. Pscheidt et al. 108). *Microstachys stipulacea*. J. Habit. K. Leaf. L. Margin. M. Inflorescence. N. Staminate flower. O. Pistillate flower. (C. Gaudichaud 1697). *Microstachys uleana*. P. Habit. Q. Leaf. R. Margin. S. Inflorescence. T. Staminate flower. U. Pistillate flower. (A.C. Pscheidt et al. 192).

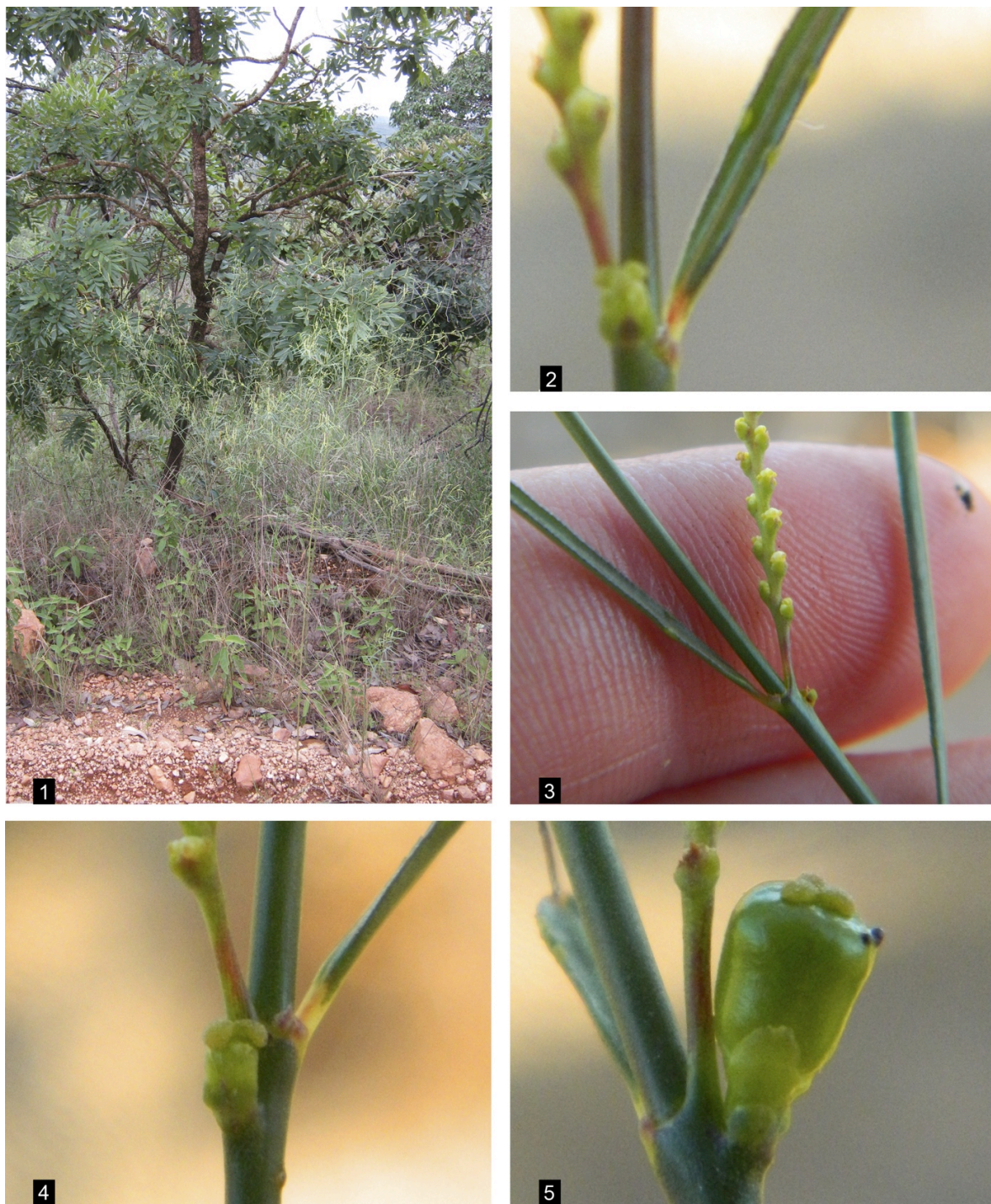


Figure 5. Images of *Microstachys bidentata*. 1. Habit. 2. Leaf with glands in detail. 3. Inflorescence. 4. Pistillate flower. 5. Fruit. (A.C. Pscheidt).

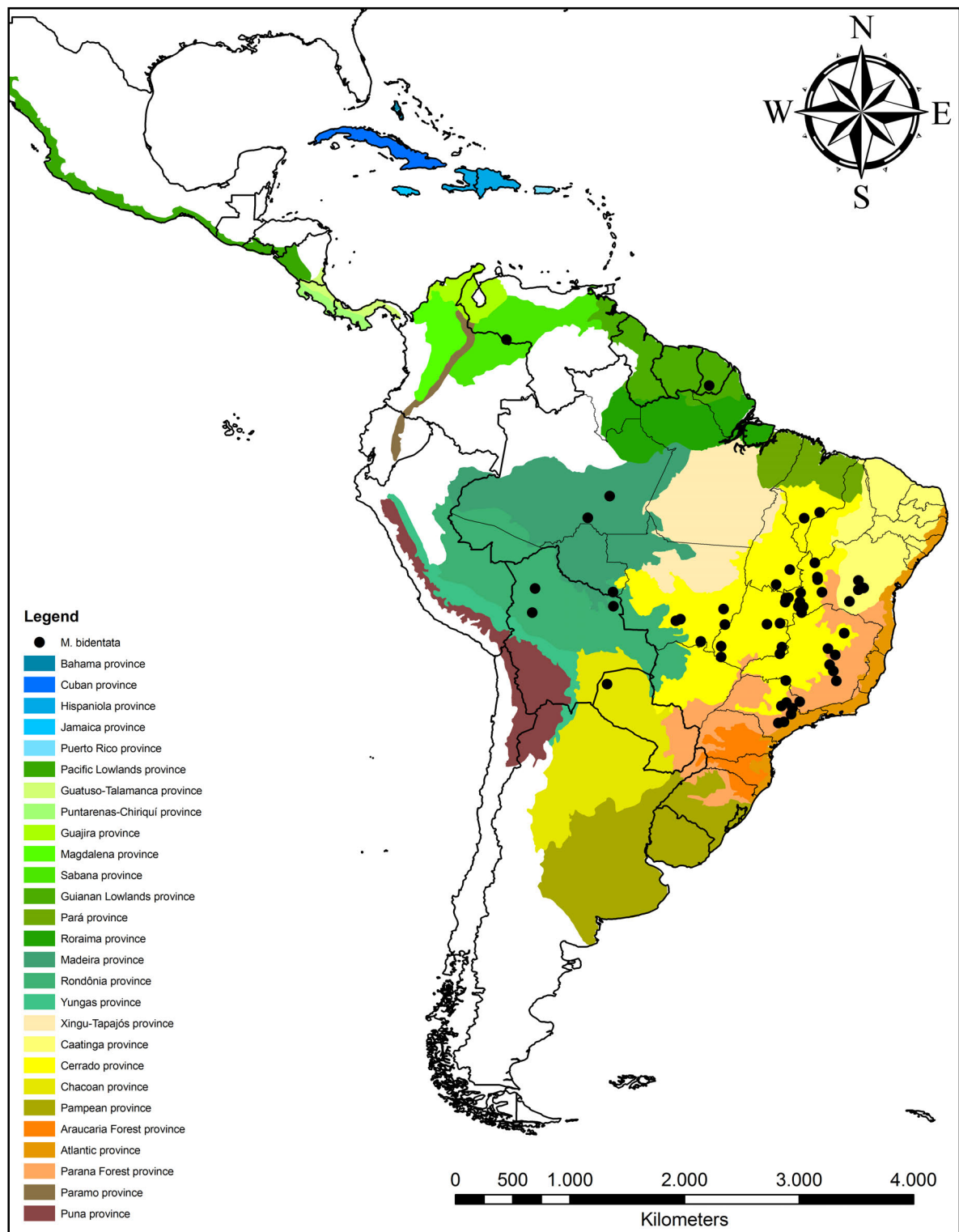


Figure 6. Distribution map of *Microstachys bidentata*.

***Microstachys corniculata* (Vahl) Jussieu (1824: 49)**

(Fig. 7 A-I, 8)

- ≡ *Tragia corniculata* Vahl (1798: 55) ≡ *Stillingia corniculata* (Vahl) Baillon (1858: 17) ≡ *Sebastiania corniculata* (Vahl) Müller Argoviensis (1866: 1168) – Lectotype (designated here): TRINIDAD. Without gazetteer and date, *Ryan 17* (C!; isolecto: C!, P!).
- = *Cnemidostachys acalyphoides* Martius & Zuccarini (1824a: 138, 1824b: 71) ≡ *Sebastiania corniculata* var. *acalyphoides* (Mart.) Müller Argoviensis (1866: 1172) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. “Bahia et Minas Gerais ad flumen S. Francisci”, without date, *Martius s.n.* (M!).
- = *Cnemidostachys glabrata* Martius & Zuccarini (1824a: 138, 1824b: 70) ≡ *Stillingia glabrata* (Mart.) Baillon (1858: pl. 8 fig. 13-16) *Sebastiania corniculata* var. *glabrata* (Mart.) Müller Argoviensis (1866: 1172) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. “prope Rio de Janeiro”, without date, *Martius s.n.* (M!; isolecto: M!).
- = *Cnemidostachys prostrata* Martius & Zuccarini (1824a: 137, 1824b: 70) ≡ *Stillingia prostrata* (Mart.) Baillon (1865: 324) ≡ *Sebastiania corniculata* var. *prostrata* (Mart.) Müller Argoviensis (1866: 1172) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Bahia, “ad flumen S. Francisci prope Juazeiro”, without date, *Martius s.n.* (M!).
- = *Cnemidostachys tragioides* Martius & Zuccarini (1824a: 137, 1824b: 70) ≡ *Sebastiania corniculata* var. *tragioides* (Mart.) Pax, Pax & Hoffmann (1912: 98), *nom. illeg.* – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Bahia, “ad marginem fluminis S. Francisci prope Malhada”, without date, *Martius s.n.* (M!).
- = *Tragia bicornis* Vahl ex Jussieu (1824: 49) ≡ *Microstachys bicornis* (Vahl) Jussieu (1824: 49) – Lectotype (designated by Webster 1994): Euphorb. Gen., pl. 15 fig. 20 (1824).
- = *Cnemidostachys vahlii* Sprengel (1826: 834), *nom. illeg. superfl.* ≡ *Microstachys vahlii* (Spreng.) Richard (1850: 202), *nom. illeg. superfl.*
- = *Tragia pilosa* Vellozo (1881: 395) – Lectotype (designated by Pscheidt *et al.* in press): FL. Flumin. Icon. 10: tab. 9 (1831) – Epitype: BRAZIL. Rio de Janeiro, without date, *Martius s.n.* (M!).
- = *Microstachys guianensis* Klotzsch (1843: 45) ≡ *Sebastiania corniculata* var. *guianensis* (Klotzsch) Pax & Hoffmann (1912: 99) – Type specimen: GUYANA. Barcellos, “on

- the Rio Negro”, 1840, *Ro. Schomburk* 912 (holo: K!; iso: BM!, E!, G!, K!, OXF!, TCD!, U! US!, W!).
- = *Microstachys micrantha* Benth (1854: 326) ≡ *Sebastiania corniculata* var. *micrantha* (Benth.) Müller Argoviensis (1866: 1173) ≡ *Sebastiania micrantha* (Benth.) Lanjouw (1940: 704) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Pará, July 1849, *Spruce* 212 (K!; isolecto: K!).
- = *Tragiopsis fruticulosa* Karsten (1859: 5) ≡ *Microstachys fruticulosa* (H.Karst.) Karsten (1869: 33) – Lectotype (designated by Pscheidt *et al.* in press): COLOMBIA. Villavicencio, Llano de St. Martin, without date, *Karsten s.n.* (W!; isolecto: GOET!, O!, W!).
- = *Cnemidostachys dubia* Wawra (1862: 241) ≡ *Cnemidostachys patula* fo. *dubia* (Wawra) Wawra (1866: 35) – Type specimen: BRAZIL. Bahia, prope Ilheus, *Wawra s.n.* (W!).
- = *Microstachys polymorpha* Müller Argoviensis (1863: 91), *nom. illeg. superfl.*
- = *Sebastiania corniculata* var. *acalyphoides* fo. *erecta* Müller Argoviensis (1866: 1172) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Bahia, “ad St. Thomé”, without date, *Blanchet* 3756 (P!; isolecto: BM!).
- = *Sebastiania corniculata* var. *egensis* Müller Argoviensis (1874: 562) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. “Alto Amazonas prope Ega”, without date, *Poeppig* 3071 (W!; isolecto: GOET!).
- = *Sebastiania corniculata* var. *glabrata* fo. *erecta* Müller Argoviensis (1866: 1172) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Bahia, without date, *Salzmann* 487 (MPU!; isolecto: W!).
- = *Sebastiania corniculata* var. *poeppigii* Müller Argoviensis (1866: 1173) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Amazonas, without date, *Poeppig* 2978 (W!; isolecto: GOET!).
- = *Sebastiania corniculata* var. *heterophylla* Müller Argoviensis (1874: 563) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. “Goias secus Rio Tocantins”, without date, *Burchell* 8527 (BR!).
- = *Sebastiania corniculata* var. *potamophila* Müller Argoviensis (1874: 562) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. “Goias ad Rio Tocantins prope Porto Nacional”, without date, *Burchell* 8642 (BR!).
- = *Sebastiania mexicana* Brandege (1905: 205) – Lectotype (designated by Pscheidt *et al.* in

press): MEXICO. Sinaloa, Culiacan, 1904, *T.S. Brandegee s.n.* (UC!).

= *Sebastiania hispida* var. *scandens* Pax & Hoffmann (1912: 111) – Type specimen: PARAGUAY. “Oberlauf des Y-acá Flusses beu Piribebuy”, without date, *Hassler 6907* (holo: B; iso: BM!, GH, K!, P!).

= *Sebastiania boliviana* Rusby (1920: 50) – Type specimen: BOLIVIA. Tumupasa, 7 December 1901, *R.S. Williams 353* (holo: NY!).

Subshrubs 30-100 cm tall, without xylopodium, erect to decumbent. Branches glabrous to pubescent, hairs ca. 0.5 mm long. **Leaves** concolor; petiole 3-15 mm long, glabrous to pubescent, hairs ca. 0.5 mm long; blade lanceolate, 1.5-6.5 × 0.5-2.5 cm, membranous, glabrous to pubescent, hairs ca. 0.5 mm long, brochidodromous, 1-6 pairs of marginal crateriform glands, 0.5 mm in diameter, base cordate to subcordate, margin serrulate, plane, denticles adpressed, 0.5 mm long, apex acute to acuminate; stipules rounded, 0.5 × 0.5 mm, pubescent. **Inflorescence** 1-5 cm long, axis glabrous to sparsely pubescent, hairs ca. 0.5 mm long; bracts 0.5 × 0.5 mm, sessile glands 0.5 mm in diameter, margin lacerate, pistillate cymule 1. **Staminate flower** 1-2, pedicellate, pedicel 0.2 mm long; sepals 0.5 × 0.5 mm, apex rounded; stamens 0.3 mm long, anthers 0.3 mm long. **Pistillate flower** subsessile, pedicel 0.2 mm long; sepals 1 × 1 mm, eglandular, apex rounded; ovary 1 × 1 mm, ornate, glabrous; stigmas 1.2 mm long, free. **Fruit** globose to oblong, 0.4-0.6 × 0.4-0.5 cm, glabrous, pedicellate, pedicel ca 1 mm long; sepals persistent, stigmas persistent; 1 pair of horn-shaped appendages in the apex and the base of each mericarp, ca. 1-2 mm long; columella 4-5 mm long. **Seed** oblong, 3-4 × 1.5-2 mm, testa spotted.

Distribution and habitat: — *Microstachys corniculata* is the most widely distributed species of the genus, occurring all over South America and also Central America, Antilles and Mexico, in sandy grasslands on wet soil, mainly at the coastal zone, in 24 phytogeographic provinces at elevations of 3–2,042 m. (Fig. 9, Table 1).

IUCN conservation assessment: — Least concern (LC): *M. corniculata* is a very widespread and abundant in the Neotropics.

Nomenclatural notes: — Jussieu (1824) published the name “*Microstachys corniculata* (Vahl) A.Juss.” as new combination of *Tragia corniculata* Vahl., however this name is invalid according ICN 33.1. An epitype for *Tragia pilosa* Vell. is choosen here to serve as an interpretative type because the designated lectotype cannot be critically identified.

Morphological notes: — *Microstachys corniculata* is the species with the highest

morphological variability in the genus. We found specimens totally glabrous and specimens pubescent. The newer leaves from the apex of the branches are narrow with rounded base and the others are wider with cordate base. The color of the flowers might be an environmental adaptation to pollination: *M. corniculata* shows specimens with reddish flowers and yellowish flowers.

This species is similar to *Microstachys crotonoides*, but shows membranous leaves (vrs. chartaceous in *M. crotonoides*) with cordate to subcordate base (vrs. obtuse), margin plane (vrs. revolute), apical and basal marginal-glands (vrs. only basal) and pubescent sepals, 0.5 mm long with entire margin (vrs. glabrous, 1.5 mm long with serrulate margin).

Additional specimens examined: — **ANTILLES.** Guadeloupe 1946, *Bene, P.* s.n. (P); Guadeloupe: Capesterre, , *Stehlé* s.n. (P); Nueva Gerona: Isla de Pinos, 8 May 1904, *Curtiss, A.H.* 266 (P).

ARGENTINA. Formosa, *Jorgensen, P.* 2855 (SI); Prov. Misiones: Bernardo de Irigoyen, 27 November 1984, *Eskuche, U.* 5295 (Z); Santa Cruz: Monte del Fraile, 1 April 1916, *Steinbach, J.* 2155 (SI).

BOLIVIA. Tumupasa, 7 December 1901, *Williams, R.S.* 353 (NY); Santa Cruz: Andrés Ibáñez, 17°55' S, 63°15' W, 22 December 1994, *Nee, M.* 46075 (NY, SP); Santa Cruz: German Busch, 19°11'42" S, 57°52'31" W, 9 March 2008, *Villarroel, D.* 2032 *et al.* (UB); Santa Cruz: Ichilo, 17°40'20" S, 63°27'25" W, 12 February 1994, *Nee, M.* 44877 *et al.* (NY, SP); Santa Cruz: Nuflo de Chavez, 29 March 1995, *Fuentes, A.* 581 (LPB, USZ); Santa Cruz: Velasco, 13°38'22" S, 60°54'05" W, 28 March 1996, *Carrion, A.* 71 (LPB).

BRAZIL. s.dat., *Blanchet* 742 (BM); Amazonas 16 December 1907, *Baker, C.F.* 14 (M); Amazonas: Humaitá, 18 November 1977, *Brantjes, N.B.M.* 700307 (U); Amazonas: Manaus, 2°53' S, 59°58' W, 10 February 1995, *Costa, M.A.S.* 141 (K); Bahia, *Blanchet* s.n. (P); Bahia: Abaíra, 13°16' S, 41°55' W, 7 April 1992, *Ganev, W.* 76 (HUEFS, K, SP, SPF); Bahia: Andaraí, 3 June 1995, *França, F.* 1202 *et al.* (HUEFS, SP); Bahia: Bom Jesus da Lapa, 1989, *Laca-Buendia, J.F.* 794 (PAMG); Bahia: Bonfim, 8 May 1918, *Curran, H.M.* 197 (GH, SP); Bahia: Campo Formoso, 10°30'49" S, 40°18'25" W, 14 August 1999, *Miranda-Silva, E.* 181 *et al.* (HUEFS, SP); Bahia: Canavieiras, 21 January 1998, *Amorim, A.M.* 2114 *et al.* (CEPEC, SP); Bahia: Chapada da Diamantina, 3 April 1976, *Davidse, G.* 11879 *et al.* (SP); Bahia: Correntina, 13°24' S, 44°35' W, 27 April 1980, *Harley, R.M.* 21819 (K); Bahia: Gentio do Ouro, 11°24' S, 42°30' W, 22 February 1977, *Harley, R.M.* 18941 (U); Bahia: Ilhéus, 11 February 1983, *Carvalho, A.M.V.* 1623 (K); Bahia: Itabuna, 14°54' S, 39°02' W, 4 December 1992, *Arbo, M.M.* 5565 *et al.* (CTES, K SP); Bahia: Ituaçu,

18 July 1931, *Giulietti, A.M.* s.n. (K); **Bahia: Jacobina**, 11°05' S, 40°40' W, 17 January 1997, *Arbo, M.M.* 7402 (K); **Bahia: Juazeiro**, *Martius* s.n. (M); **Bahia: Jussiape**, 17 February 1987, *Harley, R.M.* 24348 *et al.* (K, SP, SPF); **Bahia: Lençóis**, 12°28' S, 41°22' W, 26 November 1992, *Arbo, M.M.* 5806 *et al.* (CTES, SP); **Bahia: Malhada**, , *Martius* s.n. (M); **Bahia: Milagres**, 12°52'09" S, 39°49'00" W, 16 March 1997, *França, F.* 2166 *et al.* (SP); **Bahia: Morro do Chapéu**, 1 June 1980, *Harley, R.M.* 22981 (U); **Bahia: Mucugê**, 12°53'53" S, 42°08'41" W, 14 July 1996, *Bautista, H.P.* PCD 3609 *et al.* (ALCB, SP); **Bahia: Olivença**, 29 January 1972, 20 (SP); **Bahia: Palmeiras**, 15 March 2008, *Costa, G.* 176 (HUEFS, SP); **Bahia: Rio de Contas**, 22 November 1988, *Harley, R.M.* 26981 (K); **Bahia: Santa Luzia**, 2 May 1990, *Carvalho, A.M.V.* 3145 *et al.* (CEPEC, SP); **Bahia: Senhor do Bonfim**, 10°22'24" S, 40°12'20" W, 27 July 2005, *Souza, E.B.* 1381 (K); **Bahia: São Thomé**, , *Blanchet* 3756 (BM, P); **Bahia: Umburanas**, 10°21' S, 41°13' W, 12 April 1999, *Queiroz, L.P.* 5403 *et al.* (HUEFS, SP); **Bahia: Una**, 15°09' S, 39°04' W, 22 September 1922, *Amorim, A.M.* 756 *et al.* (CEPEC, SP); **Bahia: Utinga**, 12°03'10" S, 41°07'33" W, 10 September 1999, *Oliveira, R.P.* 206 *et al.* (HUEFS, SP); **Bahia: Vila do Santo Antônio**, 12°27'07" S, 37°56'02" W, 21 July 2010, *Pinto, R.B.* 129 *et al.* (RB, SP); **Bahia: Vitoria da Conquista**, 4 March 1978, *Mori, S.A.* 9447 (K); **Bahia: Vitória da Conquista**, 16 October 1981, *Hatschbach, G.* 44279 (MBM); **Ceará: Bahia**, 1914, *Luetzelburg* 31 (M); **Ceará: Bom fim**, 1 October 1934, *Luetzelburg* 26272 (M); **Ceará: Jaboleiros**, 20 September 1934, *Luetzelburg* 26269 (M); **Distrito Federal**, 15 April 1987, 858 (HEPH, SP); **Distrito Federal: Brasília**, 15 September 1965, *Irwin, H.S.* 8349 *et al.* (NY, SP); **Distrito Federal: Sobradinho.**, 5 October 1965, *Irwin, H.S.* 8980 *et al.* (NY, SP); **Distrito Federal: Planaltina**, 25 October 1965, *Irwin, H.S.* 9538 *et al.* (NY, SP); **Espírito Santo** 15 December 1962, *Mattos, J.* 10763 *et al.* (SP); **Espírito Santo: Linhares**, 27 June 2001, *Folli, D.A.* 3953 (CVRD, SP); **Espírito Santo: Sooretama**, 2 November 2011, *Takeuchi, C.* 94 *et al.* (SP); **Goias** 15 October 1990, *Hatschbach, G.*; *M* 54553 *et al.* (Z); **Goias: Alto Horizonte**, 14°11'44" S, 49°20'19" W, 23 February 2010, *Faria, J.E.Q.* 797 (HUEG, UB); **Goias: Alto Paraíso**, 8 March 1973, *Anderson, W.R.* 6605 (K); **Goias: Cavalcante**, 13°24'17" S, 48°06'54" W, 12 December 2000, *Silva, G.P.* 4441 *et al.* (CEN, SP); **Goias: Minacu**, 18 April 2001, *Silva, G.P.* 4976 *et al.* (CEN, SP); **Goias: Nova Roma**, 13°43'42" S, 46°52'44" W, 1 March 2000, *Silva, M.A.* 4317 *et al.* (IBGE, SP); **Goias: Paraíso**, 23 March 1968, *Irwin, H.S.* 21658 (K); **Goias: Pirenópolis**, 7 February 1990, *Arbo, M.M.* 3825 (K); **Goias: São Domingos**, 13°38'10" S, 46°19'01" W, 29 October 2000, *Fonseca, M.L.* 2358 *et al.* (IBGE, SP); **Goias: Teresina de Goias**, 13°36'52" S, 47°13'20" W, 15 January 2013, *Francener, A.* 1256 *et al.* (SP); **Goias: Veadeiros**, March 1969, *Irwin, H.S.* 24630 (K); **Maranhão: Barra do Corda**, 11 May 1988,

Bianchetti, L.B. 621 *et al.* (CEN, SP); **Maranhão: Carolina**, 15 April 1983, *Silva, M.F.F.* 1123 (K); **Maranhão: Loreto**, 7°00' S, 45°07' W, 26 March 1962, *Eiten, G.* 3843 *et al.* (SP); **Maranhão: São Luis**, 1939, *Froes, R.* 11761 (U); **Maranhão: São Raimundo das Mangabeiras**, 7°00' S, 45°50' W, 15 March 1962, *Eiten, G.* 3680 *et al.* (SP); **Mato Grosso** 3 July 1977, *Krapovickas, A.* 32929 *et al.* (CTES); **Mato Grosso: Coxim**, 13 November 1973, *Hatschbach, G.* 33189 *et al.* (Z); **Mato Grosso: Cuiabá**, 8 March 1946, *Bon, A.* 15721 (SD); **Mato Grosso: Poconé**, 16 December 1976, *Allem, A.* 735 (CEN, SP); **Mato Grosso do Sul: Bataguassu**, 20 November 1992, *Cordeiro, I.* 980 *et al.* (SP); **Mato Grosso do Sul: Corumbá**, 19°11'40" S, 57°36'32" W, 10 November 1995, *Bortolotto, I.M.* 104 *et al.* (COR, UEC); **Mato Grosso do Sul: Nioaque**, 21°12'49" S, 55°31'32" W, 2 April 2001, *Pott, A.* 8772 *et al.* (HMS, SP); **Mato Grosso do Sul: Rochedo**, 25 January 1979, *Sano, S.M.* 8 (SP); **Minas Gerais** 30 March 1976, *Davidse, G.* 11607 *et al.* (SP); **Minas Gerais: Buenópolis**, 17°53' S, 44°15' W, 13 October 1988, *Harley, R.M.* 24948 *et al.* (F); **Minas Gerais: Diamantina**, June 1934, *Brade* 13591 (Z); **Minas Gerais: Frei Innocência**, 31 January 1972, *Gemtchújnicov, I.D.* 14 (SP); **Minas Gerais: Grão Mogol**, 16°35'27" S, 42°53'27" W, 24 June 2012, *Cordeiro, I.* 3351 *et al.* (SP); **Minas Gerais: Joaquim Felício**, 21 October 1999, *Hatschbach, G.* 69426 (MBM, U); **Minas Gerais: Lima Duarte**, 23 March 1995, *Luchi, A.E.* 432 *et al.* (SP); **Minas Gerais: Ouro Preto**, , 18599 (SP); **Minas Gerais: Passa Quatro**, 22°26'58" S, 44°53'50" W, 5 May 2006, *Meireles, L.D.* 2345 *et al.* (SP, UEC); **Minas Gerais: Rio Preto**, 3 October 1987, *Brügger, M.C.* s.n. *et al.* (CESJ, SP); **Minas Gerais: Santa Bárbara do Monte Verde**, 21°58' S, 43°49' W, 25 February 1999, *Mello-Silva, R.* 1638 *et al.* (K, RB, SP, SPF); **Minas Gerais: Santana do Riacho**, 17 May 2012, *Andrade, I.R.* 450 (BHZB, SP); **Minas Gerais: Serra do Espinhaço**, 26 January 1969, *Irwin, H.S.* 22602 *et al.* (NY, SP); **Minas Gerais: São Gonçalo do Rio Abaixo**, 2 December 1987, *Stehmann, J.R.* PT s.n. *et al.* (CETEC, SP); **Minas Gerais: São Roque de Minas**, 17 December 1998, *Farinaccio, M.A.* 272 *et al.* (SP, SPF); **Paraná** 25 October 1989, *Kramer, K.U.* 10832 *et al.* (Z); **Paraná: Caioba**, 26 March 1967, *Lindeman, J.C.* 5070 (U); **Paraná: Guaratuba**, 24 July 1967, *Hatschbach, G.* 16755 (L); **Paraná: Paranagua**, 18 May 1964, *Hatschbach, G.* 11302 (B); **Paraná: Porto Amazonas**, 25°33'16" S, 49°49'01" W, 19 October 2012, *Pscheidt, A.C.* 186 *et al.* (SP); **Paraná: São Tomé**, 7 April 1966, *Lindeman, J.C.* 978 (K); **Paraíba** 12 February 1850, *Luetzelburg* s.n. (M); **Pará** 16 December 1907, *Baker, C.F.* 14 (BM); **Pará: Alto Tapajós**, 7°35' S, 57°31' W, 22 February 1974, *Anderson, W.R.* 11116 (K); **Pará: Baião**, 2 June 1978, *Brantjes, N.B.M.* 706407 (SP); **Pará: Barcarena**, 1°29'18" S, 48°42'01" W, 13 March 2002, *Silva, A.S.L.* 3479 *et al.* (MG, SP); **Pará: Belem**, November 1896, *Huber, J.* 514 (BM); **Pará: Belterra**, 17 July 1947, *Black, G.* 47-1056 (U); **Pará: Gorotire**, 7°47' S,

51°70' W, 19 January 1983, *Gottsberger, G.* 31-19183 (U); **Pará: Monte Alegre**, 6 May 1953, *Lima, A.* 53-1375 (K); **Pará: Parintins**, , *Pires, J.M.* 1161 (U); **Pará: Santarém**, , *Pires, J.M.* 1129 (U); **Pernambuco** December 1857, *Douglas* 1133 (K); **Pernambuco: Buique**, 8°36' S, 37°10' W, 18 October 1994, *Araujo, A.* 6 (K); **Pernambuco: Olinda**, June 1924, *Pickel, B.* 18602 (SP); **Piauí** January 1907, *Ule, E.* 7450 (K); **Piauí: Gilbués**, 18 February 1995, *Rodrigues, S.M.* 276 (SP); **Piauí: Serra Branca**, January 1907, *Ule, E.* 7450 (L); **Piauí: São Miguel do Tapuio**, 6°00' S, 41°23' W, 19 May 1988, *Bianchetti, L.B.* 692 *et al.* (CEN, SP); **Rio Grande do Norte: Jucurutu**, 6°14'18" S, 37°02'57" W, 29 May 2010, *Jardim, J.G.* 5776 *et al.* (SP, UFRN); **Rio Grande do Sul: Sarandi**, 4 December 1986, *Mattos, J.* 30362 *et al.* (HAS, SP); **Rio Grande do Sul: Taquari**, November 1986, *Sobral, M.* 5192 (ICN, SP); **Rio Grande do Sul: Tupaceretan**, 30 January 1942, *Rambo, B.* 10122 (SP); **Rio de Janeiro**, , *Warming* s.n. (P); **Rio de Janeiro: Cabo Frio**, 22°55'30" S, 42°19'40" W, 15 July 2006, *Paula-Souza, J.* 6009 *et al.* (ESA, SI); **Rio de Janeiro: Itauna**, 9 October 1977, *Maas, P.J.* 3130 (K); **Rio de Janeiro: Jacarepaguá**, 3 May 1969, *Colaris, W.J.J.* 1040 (U); **Rio de Janeiro: Leandro do Sacramento**, , *Martius* s.n. (M); **Rio de Janeiro: Macaé**, June 1841, *Gardner* 6088 (BM); **Rio de Janeiro: Morro de São João**, September 1914, *Hoehne, F.C.* 91 (SP); **Rio de Janeiro: Paraty**, 23°04'03" S, 44°56'19" W, 2 March 2012, *Pscheidt, A.C.* 126 (SP); **Rio de Janeiro: Rio de Janeiro**, 11 October 1938, *Alston, A.H.G.* 5 (BM); **Roraima: Boa Vista**, 2°51'34" S, 60°39'26" W, 24 October 2011, *Matos, M.N.F.* 67 *et al.* (MIRR, SP); **Santa Catarina** 15 February 1967, *Eskuche, U.* 1269-37 (Z); **Santa Catarina: Barra do Itajai**, April 1869, *Mueller, F.* 390 (K); **Sergipe: Santa Luzia do Itanhy**, 11°23'94" S, 37°25'79" W, 11 November 2011, *Gomes, L.A.* 262 (ASE, M); **Sergipe: Santo Amaro das Brotas**, 10°47'20" S, 36°58'36" W, 16 June 2000, *Sousa, G.* 362 *et al.* (CEPEC, SP); **São Paulo: Ararapira**, 27 April 1918, *Hoehne, F.C.* 1881 (SP); **São Paulo: Bertioiga**, 14 January 1999, *Anunciação, E.A.* 665 *et al.* (HUSC, SP); **São Paulo: Cananéia**, 25°01'04" S, 47°54'43" W, 8 September 1994, *Hoffmann, J.R.R.* 63 *et al.* (PMSP, SP, UBC); **São Paulo: Iguape**, 28 May 1996, *Queiroz, L.P.* 4489 *et al.* (SP); **São Paulo: Ilha do Cardoso**, 8 October 1980, *Forero, E.* 8630 *et al.* (SP); **São Paulo: Itanhaem**, 28 July 1954, *Kuhlmann, M.* 2971 (SP); **São Paulo: Litoral sul de São Paulo**, 26 September 1980, *Castro, M.I.F.* 43 (SP); **São Paulo: Mongaguá**, 24°06' S, 46°33' W, 27 April 1985, *Amaral Júnior, A.* 100 *et al.* (BOTU, SP); **São Paulo: Pariquera-Açú**, 24°45'58" S, 47°38'41" W, 15 February 1995, *Leitão-Filho, H.F.* 33286 (SP); **São Paulo: Peruíbe**, 24°17' S, 47°00' W, 3 November 1979, *Castellani, M.R.* 7 (SP); **São Paulo: Rancharia**, 22°24'53" S, 51°02'35" W, 14 February 1996, *Souza, V.C.* 10915 *et al.* (ESA, PEURF, SP); **São Paulo: Silveiras**, 22°48'33" S, 44°46'58" W, 26 March 2009, *Aragaki, S.* 1238 *et al.* (SP); **São Paulo: Ubatuba**, 25 March

1996, *Assis, M.A.* 759 (HRCB, SP); **Tocantins: Conceição do Tocantins**, 11 May 2000, *Hatschbach, G.* 70901 *et al.* (MBM).

COLOMBIA. s.dat., *Lehmann, F.C.* 4546 (K); **Bogota**, *Triana, J.* s.n. (K); **San Martin** July 1961, *Schwabe, W.* s.n. (B); **Santa Marta** 1901, *Herbert, M.* 359 (P); **Villavicencio: Bogota**, s.dat., *Triana, J.* 3653 (BM); **Villavicencio: San Martin**, s.dat., *Haussknecht, C.* s.n. (M).

CUBA. 15 October 1941, *Morton, C.V.* 3001 (BM); **Habana: Santiago de las Vegas**, 3 August 1904, *Wilson* 490 (L); **Isla de Pinos: Nueva Gerona**, 8 May 1904, *Curtiss, A.H.* 266 (M); **Oriente** 4 October 1919, *Ekman, E.L.* 9801 (K); **Pinar del Rio: Guane**, 220710°00' N, 840030°00' W, 5 January 2001, *Greuter, W.* 25612 (B); **Santa Clara: Cienfuegos**, 6 June 1895, *Combs, R.* s.n. (P).

DOMINICAN REPUBLIC. 24 August 1968, *Liogier, A.H.* 12318 (P).

FRENCH GUIANA. 1858, *Sagot, T.* 504 (K); **Camopi** 10 February 1968, *Oldeman* 148 (P, U); **Cayenne**, *Richards, P.W.* s.n. (C, P); **Cayenne: Mont Baduel**, 4°55' N, 52°19' W, 23 May 1987, *HoFF, M.* 5213 (CAY, U); **Cayenne: Organabo**, 26 June 1985, *Feuillet, C.* 2333 (B, BR, MO, NY, P, U, US); **Crique Rocoucua: Bassin de L'iracoubo**, 26 March 1992, *Cremers, G.* 12878 (CAY, MG, P); **Javouhey: Mana**, 53620°00' N, 534848°00' W, 5 September 2009, *Tostain, O.* 3279 (P); **Kourou Juin** June 1969, *Petitbon* 9 (P); **Kourou Juin** June 1969, *Petitbon* 207 (P); **Mana** 1858, *Sagot, T.* 504 (P); **Mana: Awala**, 5°41' N, 53°48' W, 30 August 1999, *Granville, J.J.* 13761 (P); **Saint Laurent** 15 February 1983, *Cremers, G.* 7995 (U); **Saint Laurent: Mana**, 5°40' N, 53°47' W, 14 April 1989, *Cremers, G.* 10609 (CAY, U, US);

GUYANA. 6 April 1976, *Grewal, M.S.* 103 (U); **Barcellos** 1840, *Schomburgk* 912 (BM, E, G, K, OXF, TCD, U, US, W); **Cayenne** 15 May 1985, *Cremers, G.* 8714 (U); **Cayenne: Montsinery**, 29 March 1984, *Granville, J.J.* 6652 (B, U); **Cayenne: Wayapi**, 1 June 1975, *Grenand* 977 (U); **Demerara** 2 May 1958, *Harrison, S.G.* 885 (K); **Essequibo: Demerara**, 6°32' N, 58°37' W, 20 December 1992, *Henkel, T.W.* 624 (U); **Kamakusa** July 1923, *Cruz, J.S.* 4219 (K); **Kangaruna: Potaro**, 1 August 1959, *Whitton, B.A.* 57 (K); **Kanuku: Moco Moco**, 3°18' N, 59°39' W, 14 July 1995, *Jansen-Jacobs, M.J.* 4465 (K); **Kourou** 21 March 1976, *Raynal, A.* 18731 (P); **Mabura Hill** 5°20' N, 58°10' W, 15 October 1993, *Ek, R.C.* 982 (U); **Macouria** 18 March 1976, *Raynal, A.* 18660 (P); **Mazaruni** 12 August 1937, *Sandwith, N.Y.* 1040 (K); **North-West: Acquero**, 20 August 1997, *Andel, T.* 1809 (U); **Onderneming** June 1904, *Bartlett, A.W.* 8548 (K); **Pomeroon** October 1922, *Cruz, J.S.* 2511 (K); **Pomeroon-Supenaam** 7°15' N, 58°43' W, 8 September 1992, *Hoffmann, J.R.R.* 2467 (U); **Potaro Landing** July 1921, *Gleason, H.A.* 477 (K); **Rpununi: Mount**

Shiriri, 17 June 1995, *Jansen-Jacobs, M.J.* 4133 (P, U); **Rupuni: Wakadanawa**, 2°01' N, 59°34'00" W, 7 September 1997, *Jansen-Jacobs, M.J.* 5403 (K); **Rupununi** 2°53' N, 59°43' W, 17 June 1995, *Jansen-Jacobs, M.J.* 4133 (K); **Saint Laurent** 26 June 1985, *Feuillet, C.* 2333 (B, BR, MO, NY, O, U, US); **Sarcelle: Mana**, 21 March 1976, *Raynal, A.* 18731 (K); **Takutu: Nappi**, 3°23' N, 59°29' W, 10 February 1993, *Hoffmann, J.R.R.* 3652 (U); **Tumatumari** July 1921, *Gleason, H.A.* 22 (K); **Waramuri: Pomeroon**, 27 October 1922, *Cruz, J.S.* 2517 (BM); **Waranama** 17 June 1958, *Harrison, S.G.* 1151 (K).

HAITI. Hispaniola 1 August 1928, *Ekman, E.L.* 10457 (K); **Massif de la Hoffe** 3 August 1926, *Ekman, E.L.* H6572 (P).

MEXICO. La Resolana 16 November 1960, *McVaugh, R.* 21101 (K); **Sinaloa: Culiacan**, 1904, *Brandeggee* s.n. (UC).

PARAGUAY. January 1900, *Hassler, E.* 6907 (K); **Cerra Peluda**, December 1932, *Girgensen, P.* 4327 (SP); **Alto Paraguay** 8 December 1957, *Woolston, A.L.* 926 (P); **Alto Paraguay: San Pedro**, 8 December 1957, *Woolston, A.L.* 926 (K, SP); **Amambay** 25 October 1991, *Soria, N.* 4933 (CTES); **Apa** October 1958, *Schwabe, W.* s.n. (B); **Canindeyú: Lagunita**, 25 March 1996, *Jiménez, B.* 39 (BM, PY); **Itapua: Yacyreta**, 272656°00' S, 564923°00' W, 1 December 2000, *Zardini, E.M.* 55545 *et al.* (M, SP); **Paraguari: Cerro Lima**, 26°02' S, 57°24' W, 22 December 1993, *Zardini, E.M.* 37606 *et al.* (M, SP);

PUERTO RICO. San Juan: Isla Verde, 20 August 1963, *Kee, M.* 10587 (P).

SURINAME. 26 August 1966, *Donselaar, J.* 3597 (U); **Albina** 17 December 1971, *Maas, P.J.* 546 (K); **Baboensanti: Marowÿne-mond**, 19 March 1977, *Teunissen, L.B.B.* 16205 (U); **Blakawatra** July 1961, *Boerboom, L.B.B.* 9173 (U); **Charlesburg Rift: Paramaribo**, 5 April 1944, *Maguire, B.* 22758 (P); **Hannover** 5 May 1959, *Donselaar, J.* 497 (U); **Jodensavanne-Mapane** 20 December 1963, *Schulz, J.P.* 1964 (K); **Kwakoeegron: Saramaca**, 3 February 1956, *Jonker-VerhoeF, A.M.E.* 526 (U); **Lobin** 4 September 1958, *Donselaar, J.* 35 (U); **Marowijne** 6 October 1961, *Hekking, W.H.A.* 1063 (U); **Marowyne** 1841, *Kappler, A.* 1886 (U); **Pamaribo** 21 November 1955, *Jonker-VerhoeF, A.M.E.* 10 (U); **Saint Laurent: Galibi**, December 1979, *Cremers, G.* 78 (U); **Saramacca** 18 August 1981, *Everaarts, A.P.* 427 (U, WAG); **Saramacca: Paka paka**, 9 February 1951, *Verhagen, T.* 1952 (U); **Sipaliwini** 30 December 1968, *Oldenburger, F.H.F.* 721 (U).

TRINIDAD & TOBAGO. 25 September 1932, *Broadway, W.E.* s.n. (BM); **Maturita près Arima**, 29 May 1975, *Raynal, A.* s.n. (P); **Aripo** 14 August 1959, *Richardson, W.D.* 678 (K); **Guanapo** 22 July 1973, *Adams, C.D.* 13343 (K); **Icacas** 11 July 1973, *Philcox, D.* 7439 (P); **Lopinot** 16 July 1973, *Philcox, D.* 7484 (P); **O'Meara** 3 August 1973, *Adams, C.D.* 13416 (K); **Saint Angustine** 7 April 1956, *Sinmonds, M.* 15397 (K); **Saint George: Mausica**,

25 August 1959, *Webster, G.L.* 9891 (U); **Saint Vicent** September 1889, *Smith, H.H.* 605 (K).
VENEZUELA. 14 July 1946, *Burkart, A.* 17188 (SI); **Bucarita** 1894, *Mocquerys* s.n.
(P); **Guarico** April 1891, *Guyon, N.* 37 (P); **Moritz** 1865, *Coripe* 443 (BM).

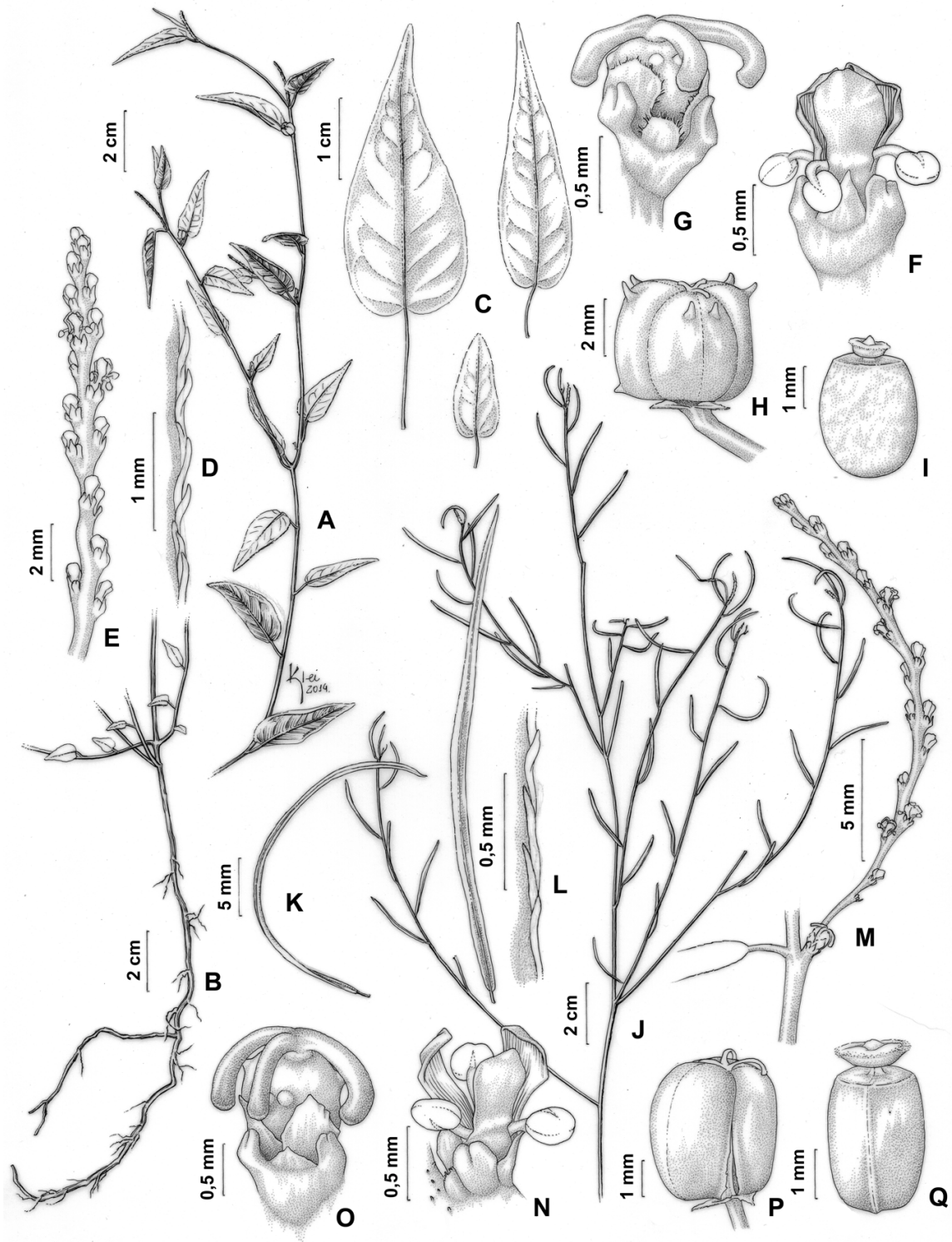


Figure 7. *Microstachys corniculata*. A. Habit. B. Root system. C. Leaves variation. D. Margin of the leaf. E. Inflorescence. F. Staminate flower. G. Pistillate flower. H. Fruit. I. Seed. (A.C. Pscheidt 126). *Microstachys salicifolia*. J. Habit. K. Leaves variation. L. Margin. M. Inflorescence. N. Staminate flower. O. Pistillate flower. P. Fruit. Q. Seed. (A.C. Pscheidt et al. 80).

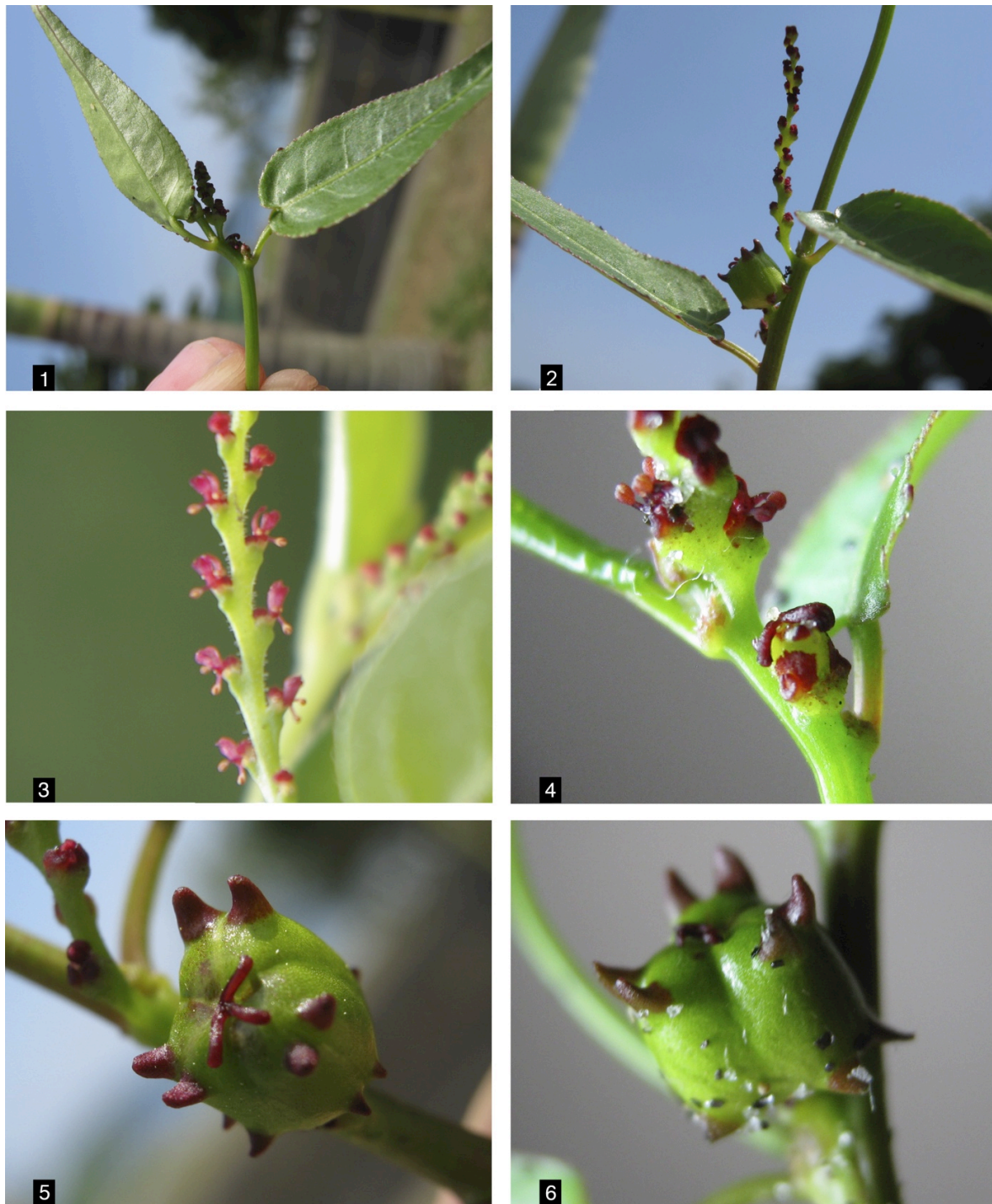


Figure 8. Images of *Microstachys corniculata*. 1. Abaxial and adaxial faces of the leaf. 2. Inflorescence. (A.C. Pscheidt). 3. Staminate flowers. (C.F. Hall). 4. Pistillate flower. 5. Fruit in transversal view. 6. Fruit in longitudinal view. (A.C. Pscheidt).

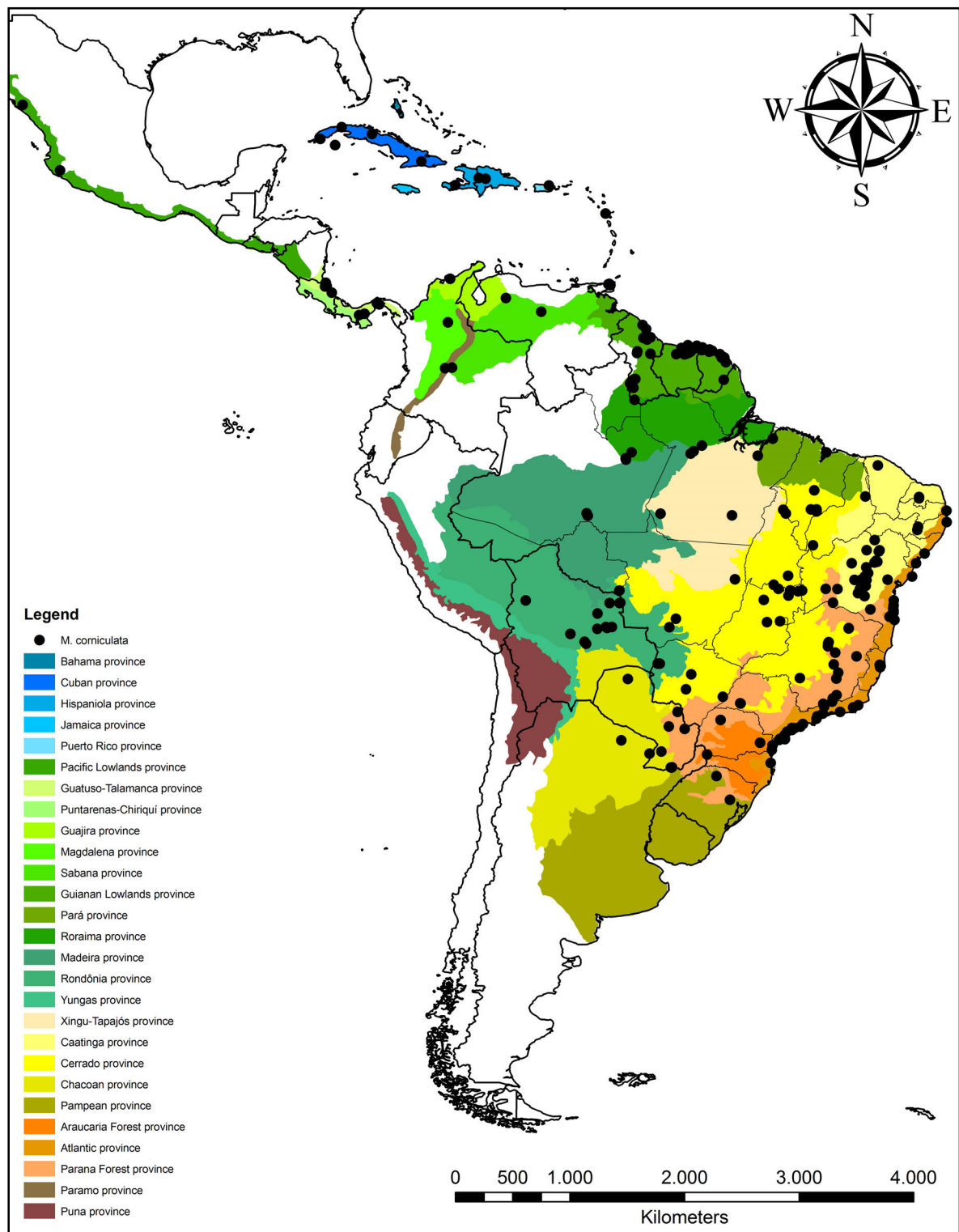


Figure 9. Distribution map of *Microstachys corniculata*.

***Microstachys crotonoides* (Martius & Zuccarini) Klotzsch ex Benth (1854: 325)**

- ≡ *Cnemidostachys crotonoides* Martius & Zuccarini (1824b: 71) ≡ *Stillingia crotonoides* (Mart. & Zucc.) Baillon (1858: 516) ≡ *Sebastiania corniculata* var. *intercedens* Müller Argoviensis (1874: 556) ≡ *Sebastiania corniculata* var. *angustifolia* fo. *crotonoides* Müller Argoviensis (1866: 1171) ≡ *Sebastiania hispida* var. *crotonoides* (Mart. & Zucc.) Pax, Pax & Hoffmann (1912: 110) ≡ *Sebastiania hispida* var. *intercedens* (Mart. & Zucc.) Pax, Pax & Hoffmann (1912: 111) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Minas Gerais, “in campis”, without date, *Martius s.n.* (M!).
- = *Sebastiania corniculata* var. *blepharophylla* Müller Argoviensis (1866: 1167) ≡ *Microstachys blepharophylla* Klotzsch, Pax & Hoffmann (1912: 110) – Type specimen: BRAZIL. Minas Gerais, without date, *Martius s.n.* (holo: B; iso: M!).
- = *Sebastiania corniculata* var. *villaricensis* Müller Argoviensis (1866: 1170) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Minas Gerais, without date, *Pohl 1720* (K!).
- = *Cnemidostachys patula* Martius & Zuccarini (1841: 8) ≡ *Sebastiania corniculata* var. *patula* (Mart. & Zucc.) Müller Argoviensis (1866: 1172) ≡ *Sebastiania hispida* var. *patula* (Mart. & Zucc.) Pax, Pax & Hoffmann. (1912: 111) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. “prope S. Georgium insulanorum”, 1839, *Martius Herb. Fl. Bras. 427* (M!; isolecto: BM!, HBG!, K!, L!, M!, MO!, NY!, P!, S!).
- = *Sebastiania corniculata* var. *macrophylla* Müller Argoviensis (1866: 1170) ≡ *Sebastiania hispida* var. *macrophylla* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 108) – Lectotype (designated here): BRAZIL. Without gazetteer and date, *Pohl 1730* (K!, isolecto: W).
- = *Sebastiania corniculata* var. *major* Müller Argoviensis (1866: 1171) ≡ *Sebastiania hispida* var. *major* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 113) – Type specimen: BRAZIL. Without gazetteer and date, *Sellow s.n.* (holo: B-destroyed).
- = *Sebastiania corniculata* var. *rufescens* Müller Argoviensis (1866: 1170) ≡ *Sebastiania corniculata* var. *rufescens* fo. *genuina* Müller Argoviensis (1866: 1170) – Lectotype (designated here): BRAZIL. Without gazetteer and date, *Sellow s.n.* (M!).
- = *Sebastiania corniculata* var. *rufescens* fo. *discopoda* Müller Argoviensis (1866: 1170) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Minas Gerais, without date, *Martius Herb. Fl. Bras. 906* (M!, isolecto: K!).
- = *Sebastiania corniculata* var. *mansoana* Müller Argoviensis (1874: 557) ≡ *Sebastiania*

- hispida* var. *mansoana* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 110) – Type specimen: BRAZIL. Goias, Manso, without date, *Helmreichen 194* (holo: W!).
- = *Sebastiania corniculata* var. *purpurella* Müller Argoviensis (1874: 558) ≡ *Sebastiania hispida* var. *purpurella* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 110) – Type specimen: BRAZIL. Minas Gerais, Lagoa Santa, 30 October 1865, *Warming 1523* (holo: C!; iso: P!).
- = *Sebastiania corniculata* var. *riedelii* Müller Argoviensis (1874: 557) ≡ *Sebastiania hispida* var. *riedelii* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 110) – Type specimen: BRAZIL. “Goias prope Alegres”, without date, *Riedel s.n.* (holo: M!).
- = *Sebastiania corniculata* var. *schuechiana* Müller Argoviensis (1874: 559) ≡ *Sebastiania hispida* var. *schuechiana* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 111) – Type specimen: BRAZIL. “Brasilia occidentalis”, without date, *Schuech s.n.* (holo: W!).
- = *Sebastiania corniculata* var. *sclerophylla* Müller Argoviensis (1874: 560) ≡ *Sebastiania hispida* var. *sclerophylla* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 113) – Type specimen: BRAZIL. Minas Gerais, without date, *Claussen 1470* (holo: W!).
- = *Sebastiania corniculata* var. *speciosa* Müller Argoviensis (1874: 560) ≡ *Sebastiania hispida* var. *speciosa* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 111) – Type specimen: BRAZIL. Minas Gerais, without date, *Pohl s.n.* (holo: W!).
- = *Sebastiania corniculata* var. *subglabrata* Müller Argoviensis (1874: 561) ≡ *Sebastiania hispida* var. *subglabrata* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 113) – Type specimen: BRAZIL. Bahia, without date, *Riedel s.n.* (holo: LE).
- = *Sebastiania corniculata* var. *paraguayensis* Chodat (1901: 398) ≡ *Sebastiania hispida* var. *paraguayensis* (Chodat) Pax, Pax & Hoffmann (1912: 111) – Type specimen: PARAGUAY. Caragaty, without date, *Hassler 1454* (holo: G).
- = *Sebastiania hispida* var. *subpatula* Pax & Hoffmann (1912: 111) – Type specimen: BRAZIL. Rio de Janeiro, without date, *Glaziou 13194* (holo: P!; iso: K!, P!).

Subshrubs 8-100 cm tall, without xylopodium, erect. Branches pubescent, hairs ca. 0.2 mm long. **Leaves** concolor; petiole 2-5 mm long, sparsely pubescent, hairs ca. 0.2 mm long; blade elliptic to lanceolate, 1-8 × 0.3-1.5 cm, chartaceous, glabrescent to sparsely pubescent at midrib, hairs ca. 0.2 mm long, brochidodromous, 1-2 pairs of marginal crateriform glands, 0.5 mm in diameter, base obtuse, margin serrulate, plane, denticles adpressed, 0.5 mm long, apex

acute to obtuse; stipules ovate, 0.5×0.5 mm, pubescent. **Inflorescence** 1.5-3 cm long, axis pubescent, hairs ca. 0.2 mm long; bracts 1×1 mm, stipitate glands 0.2 mm in diameter, margin apically lacerate, pistillate cymule 1. **Staminate flower** 3, pedicellate, pedicel ca. 0.2 mm long; sepals 1×0.5 mm, apex rounded; stamens 0.4 mm long, anthers 0.4 mm long. **Pistillate flower** pedicellate, pedicel 0.5 mm long; sepals 1×1 mm, glandular, apex retuse; ovary 1×1 mm, ornate, glabrous; stigmas 1 mm long, free. Fruit oblong, $0.5-0.6 \times 0.3-0.4$ cm, glabrous, pedicellate, pedicel ca. 0.5 mm long; sepals persistent, stigmas persistent; 1 pair of horn-shaped appendages on each mericarp, often apically, ca. 1 mm long; columella 3-4 mm long. **Seed** oblong, 3×2 mm, testa spotted.

Distribution and habitat: — *Microstachys crotonoides* occurs in grasslands throughout South America at elevations of 200-1,050 m, in ten phytogeographic provinces (Fig. 10, Table 1).

IUCN conservation assessment: — Least Concern (LC) due to its wide distribution in South America.

Morphological notes: — *Microstachys crotonoides* resembles *M. corniculata* and *M. salicifolia*, but differs by its leaves with rounded base and acute to obtuse apex, which are cordate and acuminate in *M. corniculata* and rounded and falciform in *M. salicifolia*, and by the apex retuse in pistillate sepals that are unique in the genus.

Additional specimens examined: — **ARGENTINA.** **Corrientes:** **Concepción**, 5 February 1968, *Krapovickas, A.* 13763 (P); **Corrientes:** **Empedrado**, 25 January 1962, *Pedersen, T.M.* 6435 (L); **Corrientes:** **Ituzaingo**, 8 February 1900, *Holinberg* 94 (SI); **Corrientes:** **Mercedes**, 23 February 1984, *Tressens, S.G.* 2429 (K); **Corrientes:** **Paso de los Libres**, 19 February 1972, *Krapovickas, A.* 21680 (P); **Corrientes:** **San Cosme**, 25 June 1973, *Lourteig, A.* 2966 (P); **Corrientes:** **San Miguel**, 7 March 1974, *Schinini, A.* 8318 (P); **Isla Apipé Grande:** **Arazá**, 26 November 1988, *Tressens, S.G.* 3480 (K).

BOLIVIA. 12 March 1904, *Fiebrig, K.* s.n. (M); 12 March 1904, *Fiebrig, K.* 3139 (M, NY); **Chuquisaca:** **Belisario Boeto**, $18^{\circ}57'00''$ S, $64^{\circ}16'37''$ W, 23 March 2004, *Wood, J.R.I.* 20501 (K); **Cochabamba:** **Campero**, $18^{\circ}22'72''$ S, $65^{\circ}04'97''$ W, 20 March 2003, *Atahuachi, M.* 744 (K); **Santa Cruz** October 1926, *Werdermann, E.* 2592 (B); **Santa Cruz:** **Andres Ibanez**, $17^{\circ}45'$ S, $63^{\circ}01'$ W, 25 November 1994, *Mostacedo, B.* 2566 (MO); **Santa Cruz:** **Ichilo**, $17^{\circ}23'$ S, $63^{\circ}40'$ W, 31 October 1990, *Nee, M.* 39643 (MO, NY); **Santa Cruz:** **Ignacio Warnes**, $17^{\circ}29'00''$ S, $63^{\circ}07'05''$ W, 21 December 1997, *Nee, M.* 47389 (MO, NY); **Santa Cruz:** **Obispo Santiesteban**, 1 November 1988, *Roca, Y.* 184 (MO, NY); **Santa Cruz:** **Santa Cruz de la Sierra**, October 1926, *Werdermann, E.* 2592 (MO); **Santa Cruz:** **Sara**,

17°19' S, 63°20' W, 7 November 1990, *Nee, M.* 39724 (MO, NY); **Santa Cruz: Vallegrande**, 18°33'00" S, 63°59'30" W, 5 February 1988, *Nee, M.* 36184 (MO, NY); **Santa Cruz: Velasco**, 13°22'06" S, 60°32'73" W, 15 January 1997, *Killeen, T.J.* 8165 (MO); **Tarija: Mendez**, 6 March 2000, *Wood, J.R.I.* 15958 (K).

BRAZIL. s.dat., *Claussen, P.* s.n. (P); **Bahia: Abaíra**, 7 April 1992, *Ganev, W.* 76 (K); **Bahia: Andaraí**, 12°50' S, 41°19' W, 24 January 1980, *Harley, R.M.* 20544 (K); **Bahia: Barreiras**, 2 March 1972, *Anderson, W.R.* 36451 (K); **Bahia: Porto Seguro**, 14 September 1998, *Amorim, A.M.* 2566 *et al.* (CEPEC, SP); **Bahia: Rio de Contas**, 13°35'52" S, 41°49'36" W, 9 December 2013, *Francener, A.* 1398 *et al.* (SP); **Espírito Santo** 1821, *St. Hilaire, A.* 253 (P); **Goiás** 1844, *Weddell, M.H.A.* 3033 (P); **Goiás: São João da Aliança**, 22 March 1973, *Anderson, W.R.* 7680 (K); **Maranhão: Carolina**, 7°07'08" S, 47°25'24" W, 17 May 2011, *Cordeiro, I.* 3273 *et al.* (SP); **Mato Grosso** 12°49' S, 51°46' W, 9 January 1968, *Philcox, D.* 3928 (P); **Mato Grosso do Sul: Corumbá**, 12 January 1986, *Conceição, C.A.* 1848 (SP); **Minas Gerais** 1840, *Claussen, P.* 470 (BM); **Minas Gerais: Barão de Cocais**, 23 January 1971, *Irwin, H.S.* 28912 (K); **Minas Gerais: Botumirim**, 29 September 1997, *Mello-Silva, R.* 1456 *et al.* (SP, SPF); **Minas Gerais: Caeté**, 19°49'17" S, 43°40'43" W, 21 September 2010, *Simão-Bianchini, R.* 1823 *et al.* (SP); **Minas Gerais: Caldas**, 28 November 1869, *Regnell, A.F.* 1735 (M); **Minas Gerais: Diamantina**, 9 April 1973, *Anderson, W.R.* 8358 (K); **Minas Gerais: Grão Mogol**, 16 February 1969, *Irwin, H.S.* 23404 (K); **Minas Gerais: Ouro Preto**, 31 January 1971, *Irwin, H.S.* 29503 *et al.* (MBM); **Minas Gerais: Santana de Pirapama**, 18°54'30" S, 43°47'21" W, 12 November 2009, *Zappi, D.C.* 2357 *et al.* (SP, SPF); **Minas Gerais: Santana do Riacho**, 12 September 2012, *Ferreira Júnior, C.A.* 0 (BHZB, SP); **Paraná: Cianorte**, 28 April 1966, *Hatschbach, G.* 14233 (P); **Paraná: Guarapuava**, 16 November 1965, *Reitz* 17764 (P); **Pará: Maracana**, 0°52' S, 47°35' W, 6 April 1980, *Davidse, G.* 17952 (K); **Rio Grande do Sul: Coxilha das Lombas**, 17 April 1950, *Rambo, B.* 46903 (K); **Rio Grande do Sul: Itapoan**, 3 April 1949, *Rambo, B.* 40843 (K); **Rio de Janeiro** August 1877, *Glaziou, M.* 8929 (K); **Rio de Janeiro: Caxias**, 3 July 1958, *Pereira, E.* 4187 (B); **Rio de Janeiro: Iguassu**, 5 January 1877, *Glaziou, A.* 8929 (P); **Rio de Janeiro: Jacarepaguá**, 10 June 1972, *Araujo, D.* 55 (B); **Rio de Janeiro: Macaé**, 18 October 1977, *Maas, P.J.* 3314 (K); **São Paulo: Jales**, 17 January 1950, *Hoehne, W.* s.n. (K); **São Paulo: Pedregulho**, 14 January 1997, *Aona, L.Y.S.* 97/20 *et al.* (SP, UEC).

PARAGUAY. October 1903, *Hassler, E.* 2363 (P); 1897, *Hassler, E.* 3477 (BM); **Zwischen Rio Apa und Rio Aquid**, 1909, *Fiebrig, K.* 4375 (M); **Amambay: Cerro Corá**, 21 August 1980, *Schinini, A.* 20328 *et al.* (CTES); **Assomption** December 1876, *Balansa, B.* 1733a (P); **Asunción** 8 January 1974, *Schinini, A.* 7951 (P); **Cordillera: Piridebuy**, 13

February 1991, *Degen, R.* 1787 (FCQ, MO); **Gran Chaco** October 1903, *Hassler, E.* 2363 (BM); **Itapua: Yacyreta**, 272656°00' S, 564923°00' W, 1 December 2000, *Zardini, E.M.* 55545 (M); **Misiones: Santiago**, 7 February 1955, *Pedersen, T.M.* 3292 (P).

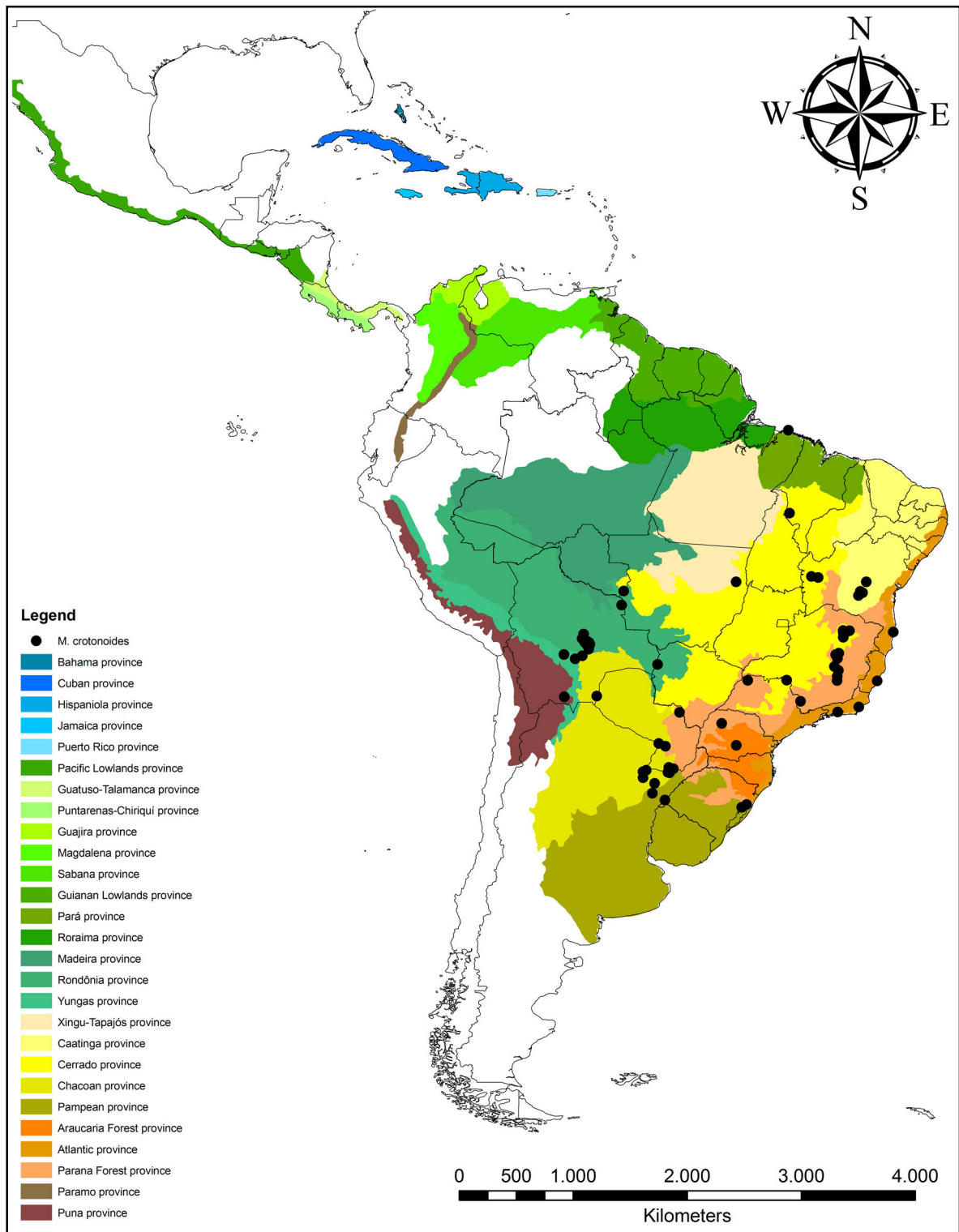


Figure 10. Distribution map of *Microstachys crotonoides*.

***Microstachys daphnoides* (Martius & Zuccarini) Müller Argoviensis (1863: 91)**

(Fig. 11 A-J, 12)

- ≡ *Cnemidostachys daphnoides* Martius & Zuccarini (1824a: 139, 1824b: 71) ≡ *Microstachys daphnoides* var. *genuina* Müller Argoviensis (1863: 91) ≡ *Sebastiania daphnoides* (Mart. & Zucc.) Müller Argoviensis (1866: 1167) ≡ *Sebastiania daphnoides* var. *genuina* Müller Argoviensis (1866: 1168) ≡ *Sebastiania myrtilloides* var. *daphnoides* (Mart. & Zucc.) Pax, Pax & Hoffmann (1912: 94) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Minas Gerais “in campis”, without date, *Martius s.n.* (M!).
- = *Cnemidostachys oleoides* Martius & Zuccarini (1824a: 137, 1824b: 71) ≡ *Microstachys daphnoides* var. *oleoides* (Mart. & Zucc.) Müller Argoviensis (1863: 91) ≡ *Sebastiania daphnoides* var. *oleoides* (Mart. & Zucc.) Müller Argoviensis (1866: 1168) ≡ *Sebastiania oleoides* (Mart. & Zucc.) Müller Argoviensis (1874: 548) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. “Minas Gerais prope Villa Rica”, without date, *Martius s.n.* (M!).
- = *Cnemidostachys myrtilloides* Martius & Zuccarini (1824a: 137, 1824b: 67) ≡ *Microstachys daphnoides* var. *myrtilloides* (Mart.) Müller Argoviensis (1863: 91) ≡ *Stillingia myrtilloides* (Mart.) Baillon (1865: 323) ≡ *Sebastiania daphnoides* var. *myrtilloides* (Mart.) Müller Argoviensis (1866: 1167) ≡ *Sebastiania myrtilloides* (Mart.) Pax, Pax & Hoffmann (1912: 93) ≡ *Sebastiania myrtilloides* var. *martiana* Pax, Pax & Hoffmann (1912: 94), *nom. illeg. superfl.* – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Minas Gerais, “in alpestris districtus adamantium”, without date, *Martius s.n.* (M!; isolecto: M!).
- = *Microstachys daphnoides* var. *incana* Müller Argoviensis (1863: 91) ≡ *Sebastiania daphnoides* var. *incana* (Müll.Arg.) Müller Argoviensis (1866: 1168) ≡ *Sebastiania myrtilloides* var. *incana* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 94) – Type specimen: BRAZIL. Bahia, “in Serra Acarua ad Certam Rio Francisco”, without date, *Blanchet 2817* (holo: G-DC!; iso: BM!, K!, NY!, OXF!, P!, TUB!).
- = *Sebastiania daphnoides* var. *intermedia* Müller Argoviensis (1874: 547) ≡ *Sebastiania myrtilloides* var. *intermedia* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 94) – Lectotype (designated here): BRAZIL. Minas Gerais, Serra da Lapa, without date, *Riedel 1006* (P!).
- = *Sebastiania daphnoides* var. *major* Müller Argoviensis (1874: 547) ≡ *Sebastiania myrtilloides* var. *major* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 94) – Type specimen:

BRAZIL. Minas Gerais, Serra do Cipó, November 1851, *Lund s.n.* (holo: C!).

Subshrubs 80-100 cm tall, without xylopodium, erect. Branches younger pubescent, older glabrescent to glabrous, hairs ca. 0.2 mm long. **Leaves** discolor; petiole 2-6 mm long, pubescent, hairs ca. 0.3 mm long; blade ovate to obovate, often elliptic, 1-4.8 × 0.4-1 cm, chartaceous, pubescent, hairs 0.3 mm long, brochidodromous, 1-5 pairs of submarginal crateriform glands, 0.3 mm in diameter, base obtuse to cuneate, margin serrulate, plane, denticles adpressed, 0.5 mm long, apex obtuse-mucronate; stipules ovate, 1 × 0.5 mm, pubescent. **Inflorescence** 1-2.5 cm long, axis puberulous, hairs ca. 0.2 mm long; bracts 1 × 0.5 mm, sessile glands 0.2 mm in diameter, margin lacerate, pistillate cymule 1. **Staminate flower** 1, pedicellate, pedicel 0.3 mm long; sepals 0.5 × 0.3 mm, apex rounded; stamens 0.3 mm long, anthers 0.3 mm long. **Pistillate flower** subsessile, pedicel 0.1 mm long; sepals 0.5 × 0.5 mm, eglandular, apex acuminate; ovary 0.5 × 0.7 mm, ornate, puberulous; stigmas 0.8 mm long, free. **Fruit** globose, 0.4 × 0.4 cm, puberulous, pedicellate, pedicel 0.6 mm long; sepals persistent, stigmas persistent; numerous horn-shaped appendages apically on each mericarp, 0.5 mm long; columella 3 mm long. **Seed** oblong, 2.5 × 1.5 mm, testa spotted.

Distribution and habitat: — *Microstachys daphnoides* has a disjunct distribution in campos rupestres and seashore plain in central and southeastern Brazil at elevations of 0–1,700 m, in Atlantic, Caatinga, Cerrado and Parana Forest provinces (Fig. 13, Table 1).

IUCN conservation assessment: — Least Concern (LC) due to the abundant populations in its distribution area, most of them within protected areas.

Nomenclatural notes: — Baillon (1865) accepted this species under the name *Stillingia myrtilloides*, with *Cnemidostachys daphnoides* and *C. oleoides* as synonyms. Müller Argoviensis (1863) however had made an earlier choice for *C. daphnoides*. Pax & Hoffmann (1912) followed Baillon (1865) accepting the name *Sebastiania myrtilloides* to include *C. daphnoides*, but not *C. oleoides*.

Morphological notes: — This species can be recognized by its discolor leaves with puberulous indumentum.

Additional specimens examined: — **BRAZIL.** *St. Hilaire*, A. 908 (P); 1821, *St. Hilaire*, A. 1244 (P); **Bahia** 4 March 1974, *Harley*, R.M. 16653 (P); **Bahia: Abaíra**, 13°18' S, 41°48' W, 27 December 1992, *Hind*, D.J.N. H 50468 *et al.* (CEPEC, HUEFS, K, SP, SPF); **Bahia: Cocos**, 14°04'08" S, 44°29'47" W, 18 April 2001, *Jardim*, J.G. 3648 *et al.* (CEPEC, SP); **Bahia: Delfino**, 10°29'54" S, 41°18'23" W, 9 March 1997, *Giulietti*, A.M. PCD 6152 *et*

al. (ALCB, K, SP); **Bahia: Lagoinha**, 10°22' S, 41°20' W, 4 March 1974, *Harley, R.M.* 16653 (M); **Bahia: Mucugê**, 13°00'24" S, 41°22'28" W, 13 February 1997, *Stannard, B.* 5540 (K); **Bahia: Piatã**, 13°13' N, 41°50' W, 26 December 1992, *Harley, R.M.* H 50405 *et al.* (CEPEC, HUEFS, K, SP, SPF); **Bahia: Rio de Contas**, 28 March 1977, *Harley, R.M.* 20078 (K); **Bahia: Umburanas**, 10°22' S, 41°19' W, 9 April 1999, *Queiroz, L.P.* 5184 *et al.* (HUEFS, SP); **Espírito Santo: Linhares**, 6 August 1992, *Farias, G.L.* 556 (K); **Goiás** 1896, *Glaziou, A.* 22099a (K); **Goiás: João Mansel**, 5 August 1895, *Glaziou, A.* 22099A (P); **Minas Gerais** 1843, *Claussen, M.* 149 (P); **Minas Gerais: Biribiry**, 24 March 1892, *Glaziou, A.* 19840 (P); **Minas Gerais: Congonhas do Norte**, 18°50'26" S, 43°44'53" W, 19 January 2004, *Lovo, J.* 30 *et al.* (F, SPF); **Minas Gerais: Couto Magalhães**, 17 July 1984, *Harley, R.M.* CFCR 4610 *et al.* (SP, SPF); **Minas Gerais: Diamantina**, June 1934, *Brade* 13593 (Z); **Minas Gerais: Gouveia**, 19 January 1969, *Irwin, H.S.* 22271 (K); **Minas Gerais: Grão Mogol**, 4 September 1985, *Cavalcanti, T.B.* CFCR 8387 *et al.* (SP, SPF); **Minas Gerais: Itabirito**, 19 December 1970, *Krieger, P.L.* 9665 *pro parte* (SP); **Minas Gerais: Jaboticatubas**, 19°20'53" S, 43°38'08" W, 7 March 2002, *Cordeiro, I.* 2769 *et al.* (SP); **Minas Gerais: Lapinha**, 24 February 1968, *Irwin, H.S.* 20806a (K); **Minas Gerais: Milho Verde**, 18°57'29" S, 43°48'76" W, 11 May 2012, *Delfini, C.* 349 *et al.* (ESA, SP); **Minas Gerais: Montes Claros**, 30 January 1965, *Belem, R.P.* 401 (K); **Minas Gerais: Santana do Riacho**, 7 September 1987, *Cordeiro, I.* CFSC 10601 *et al.* (SP, SPF); **Minas Gerais: Santana do Pirapama**, 18°59'49" S, 43°46'03" W, 5 March 2009, *Zappi, D.C.* 1701 *et al.* (SP, SPF); **Minas Gerais: Serro**, 24 November 1997, *Hatschbach, G.* 67464 *et al.* (MBM, SP); **Minas Gerais: Uberlândia**, 26 February 1988, *Barbosa, A.A.A.* 227 *et al.* (SP); **Rio de Janeiro: Maricá**, 8 April 1977, *Krieger, P.L.* 14737 (SP); **Rio de Janeiro: Rio de Janeiro**, 7 February 1964, *Hoehne, W.* 5576 *et al.* (SP); **São Paulo: São Simão-Santa Rosa**, 13 December 1938, *Otacílio, P.* 4278 *et al.* (IAC, SP); **São Paulo: Votuporanga**, 29 November 1994, *Bernacci, L.C.* 822 *et al.* (IAC, PMSP, SP, UEC).

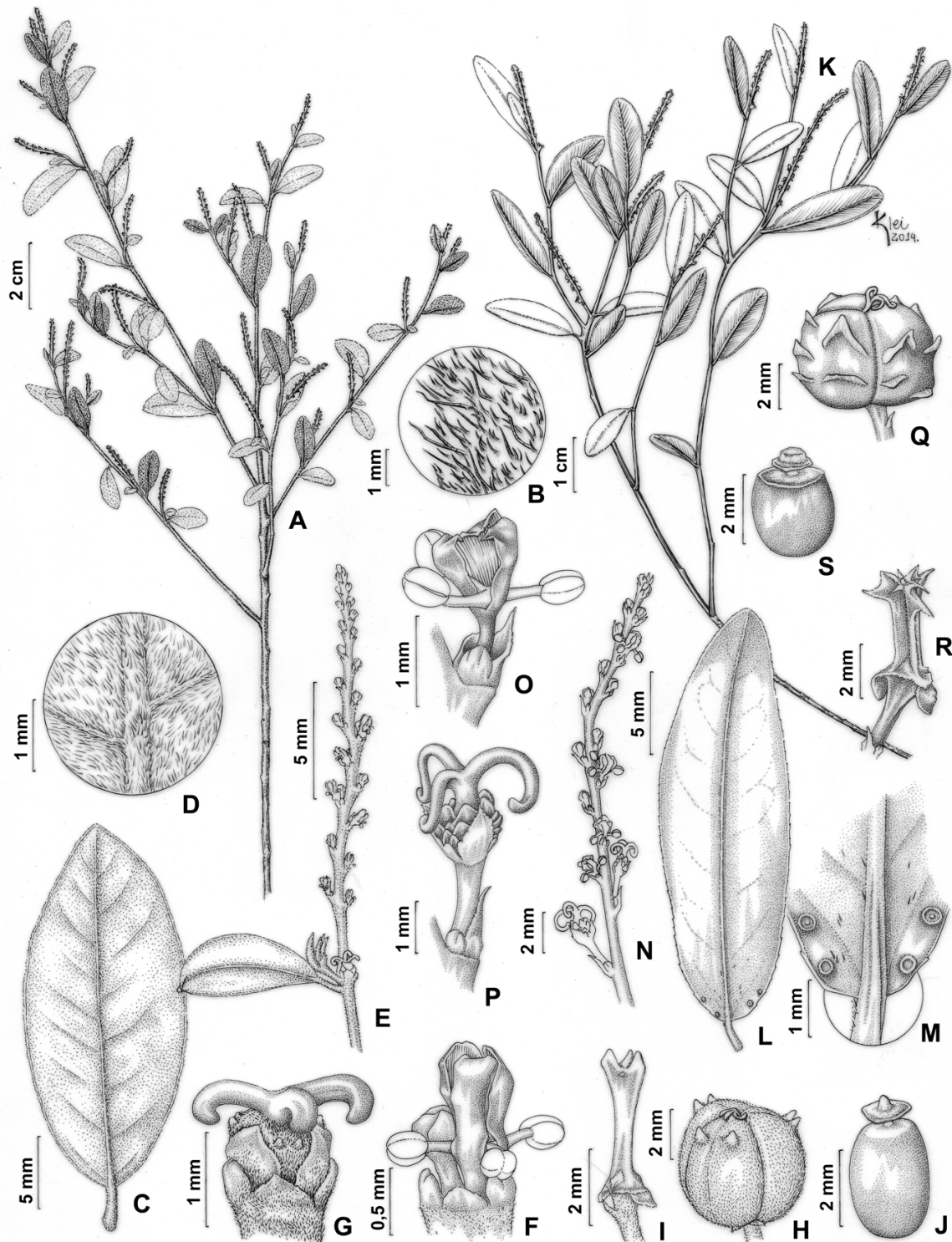


Figure 11. *Microstachys daphnoides*. A. Habit. B. Indument. C. Leaf. D. Indument of the leaf. E. Inflorescence. F. Staminate flower. G. Pistillate flower. H. Fruit. I. Columella. J. Seed. (A.C. Pscheidt et al. 87). *Microstachys nana*. K. Habit. L. Leaf. M. Basal glands. N. Inflorescence. O. Staminate flower. P. Pistillate flower. Q. Fruit. R. Columella. S. Seed. (I. Cordeiro et al. 3375).

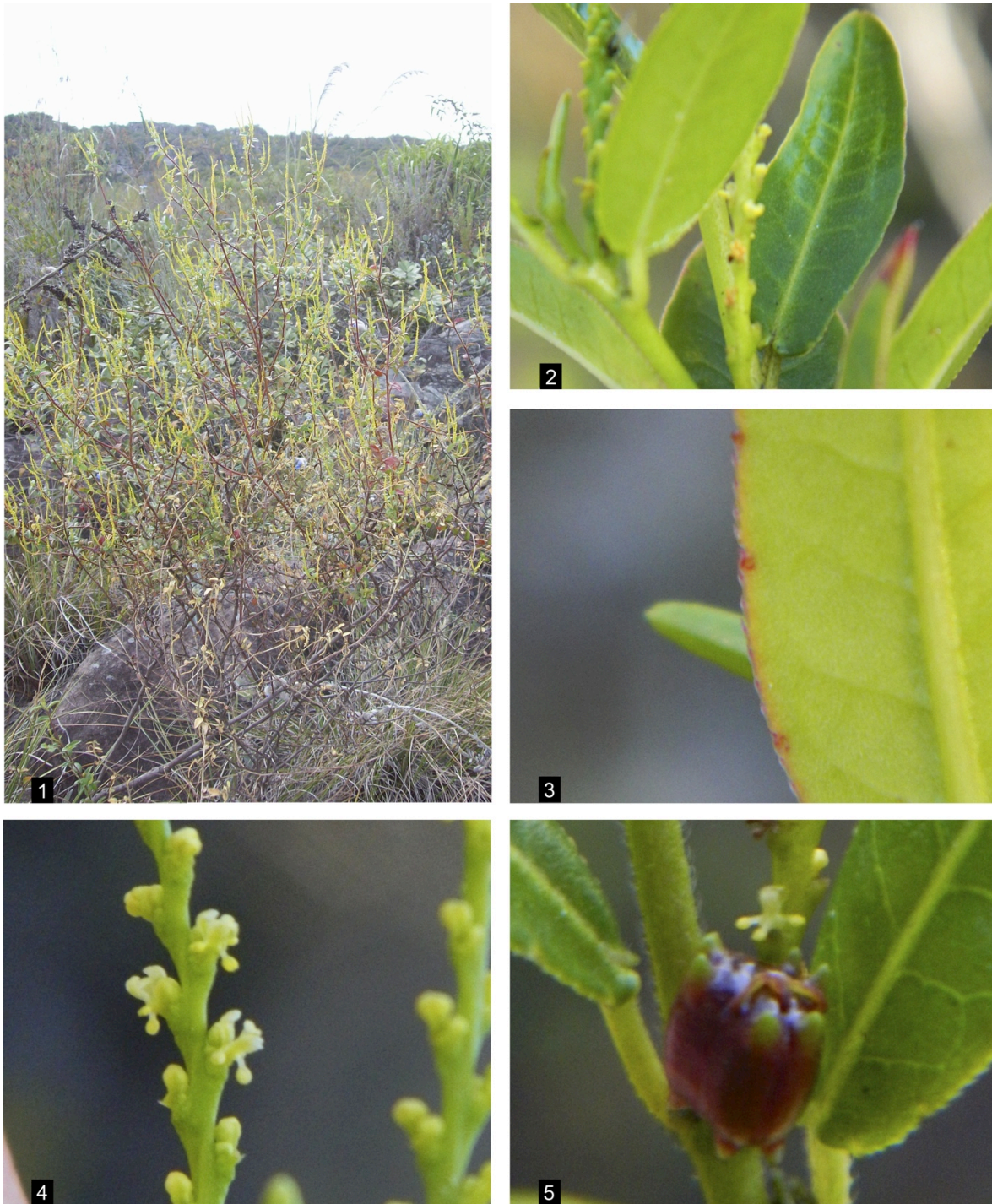


Figure 12. Images of *Microstachys daphnoides*. 1. Habit. 2. Leaves. 3. Margin of the leaf. 4. Staminate flowers. 5. Immature fruit. (A.C. Pscheidt).

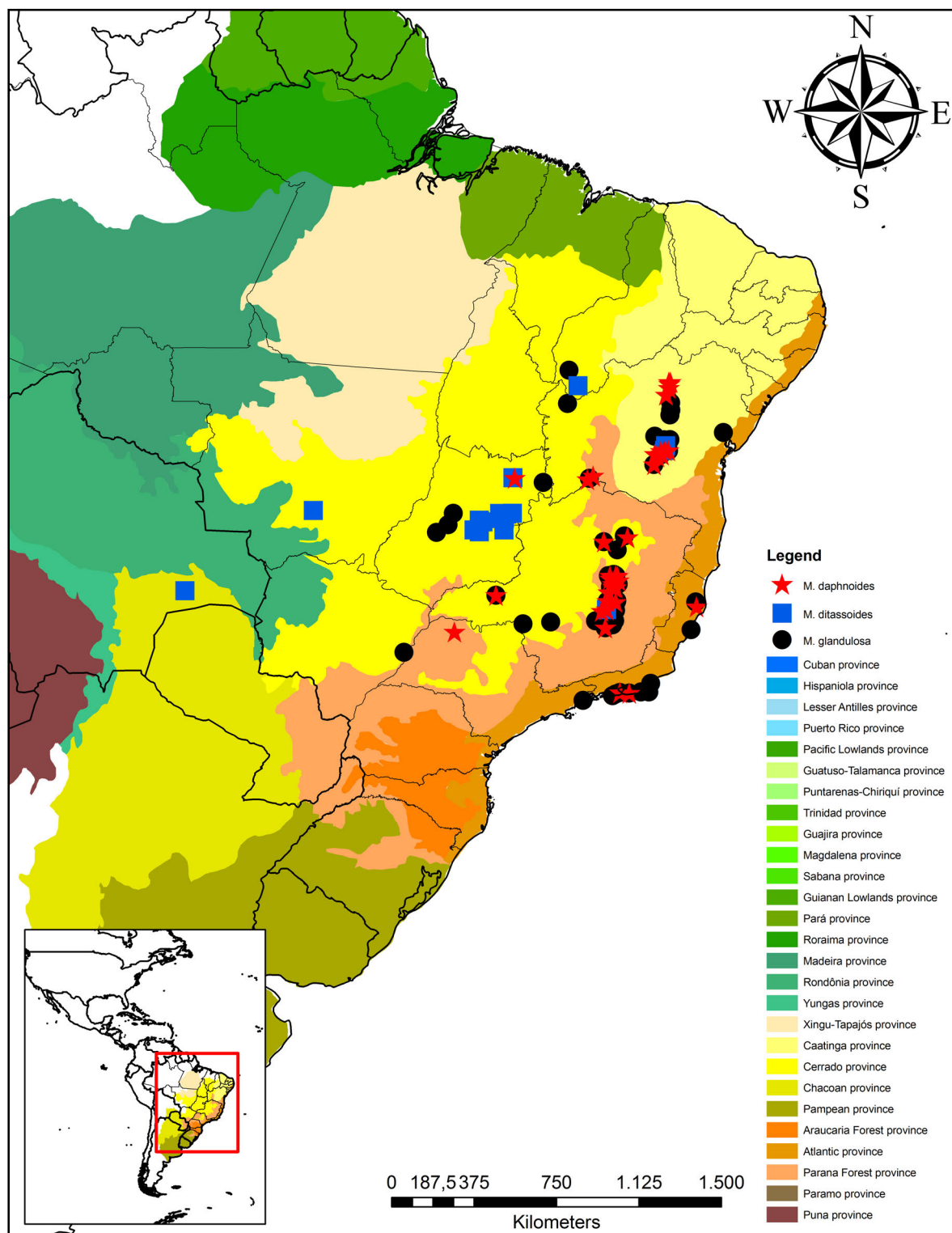


Figure 13. Distribution map of *Microstachys daphnoides*, *M. ditassoides* and *M. glandulosa*.

***Microstachys dasycarpa* Pscheidt, Esser & Cordeiro (in press)**

– Type specimen: PARAGUAY. Boquerón, Nueva Asunción, 12 Dezember 1987, *A. Schinini & Palacios* 25685 (holo: CTES!; iso: M!, SP!).

Subshrub 80-100 cm tall, with xylopodium, caespitose. Branches glabrous. **Leaves** concolor; petiole 2-4 mm long, sparsely pubescent to glabrescent, hairs 0.5 mm long; blade linear to lanceolate, $2.5\text{--}5 \times 0.25\text{--}0.5$ cm, chartaceous, sparsely pubescent, hairs 0.2-0.5 mm long, hyphodromous, 1 pair of submarginal discoid glands, 0.4-0.5 mm in diameter, base attenuate, margin serrulate, plane to revolute, denticles adpressed, 0.2 mm long, apex obtuse; stipules ovate, 0.5×0.5 mm, pubescent. **Inflorescence** 1.5-5 cm long, axis glabrous; bracts $0.4\text{--}0.6 \times 0.5$ mm, basal sessile glands 0.2 mm in diameter, margin lacerate, pistillate cymule 1-2. **Staminate flowers** 3, pedicellate, pedicel 0.2 mm long; sepals $0.5\text{--}0.6 \times 0.5$ mm, apex rounded; stamens 0.2 mm long, anthers 0.3 mm long. **Pistillate flower** subsessile, pedicel 0.2 mm long; sepals $0.5\text{--}0.7 \times 0.3$ mm, eglandular, apex obtuse; ovary 0.9×0.7 mm, ornate, tomentose; stigmas 0.2 mm long., free. **Fruit** oblong, 0.6×0.5 cm, sparsely tomentose, pedicellate, pedicel 1-1.5 mm long; sepals non-persistent, stigmas persistent; with nodiform appendagens on each mericarp, 0.2 mm long; columella 1 mm long. **Seed** not seen.

Distribution and habitat: — *Microstachys dasycarpa* is endemic to Paraguay, occurring in the Chacoan phytogeographic province (Fig. 14, Table 1).

IUCN conservation assessment: — Near Threatened (NT): the data have been evaluated against the criteria but the species does not qualify for CE, EN or VU categories.

Morphological notes: — *Microstachys dasycarpa* is similar to *M. bidentata* but differs by its tomentose ovary that is glabrous in *M. bidentata*.

Additional specimens examined: — PARAGUAY. December 1909, *Fiebrig, K.* 4375 (BM); Boquerón: Nueva Asuncion, $205421^{\circ}00'$ S, $615027^{\circ}00'$ W, 27 January 1995, *Zardini, E.M.* 42235 (M).

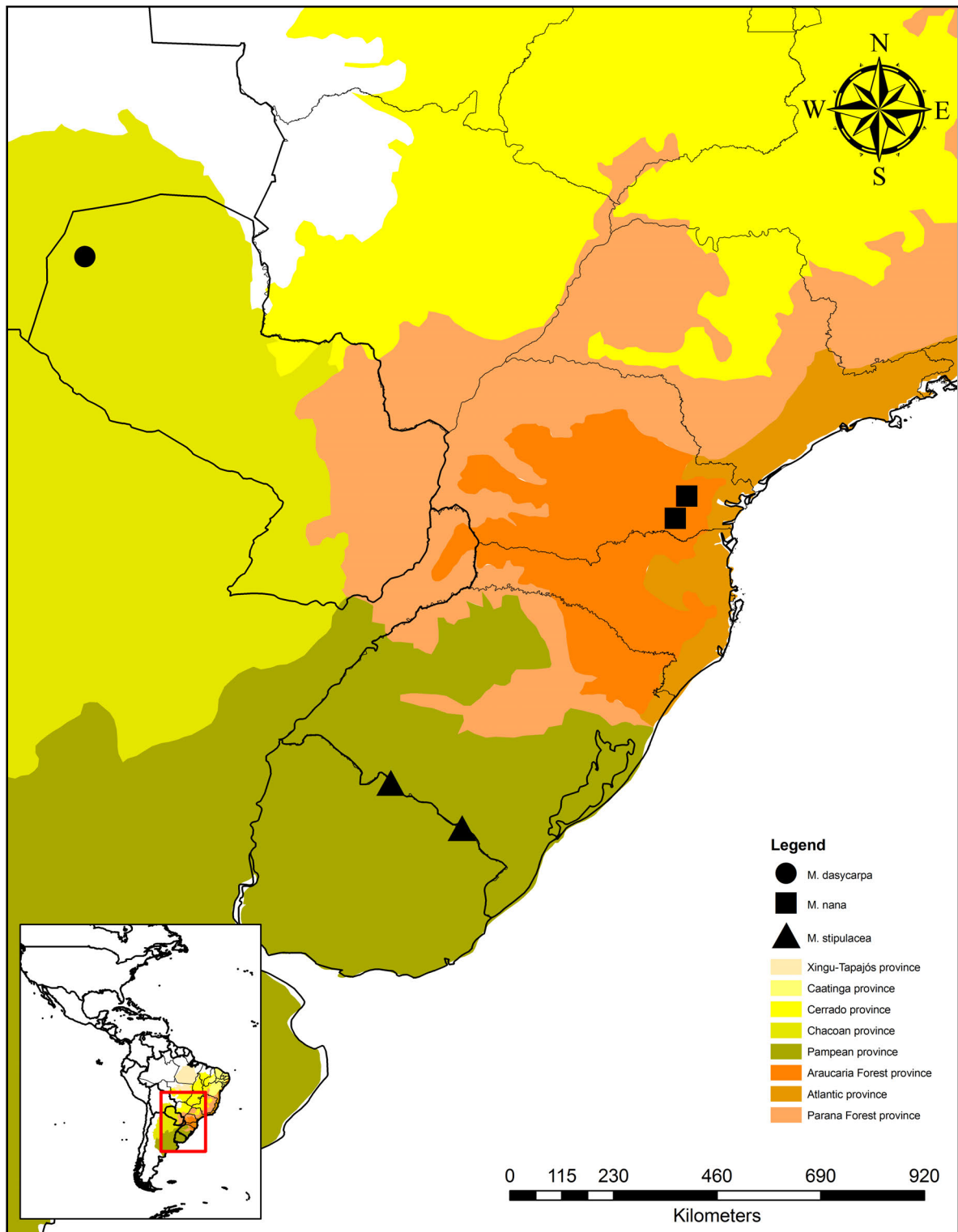


Figure 14. Distribution map of *Microstachys dasycarpa*, *M. nana* and *M. stipulacea*.

***Microstachys ditassoides* (Didrichsen) Esser (1999: 958)**

(Fig. 15 A-F, 16)

- ≡ *Cnemidostachys ditassoides* Didrichsen (1853: 88) ≡ *Sebastiania ditassoides* (Didr.) Müller Argoviensis (1866: 1174) ≡ *Sebastiania ditassoides* var. *genuina* Müller Argoviensis (1866: 1174) – Type specimen: BRAZIL. Goias, Alegres, September 1934, *Lund s.n.* (holo: C!; iso: C!, GH!).
- = *Microstachys sessilifolia* Müller Argoviensis (1863: 95) ≡ *Stillingia hastata* Klotzsch ex Baill., Baillon (1865: 324) ≡ *Microstachys hastata* Klotzsch, Baillon (1865: 324), *nom. illeg. superfl.* – Lectotype (designated by Baillon 1865): BRAZIL. Without gazetteer and date, *Sellow s.n.* (P!, isolecto: B, K!).
- = *Microstachys sessilifolia* fo. *apiculata* Müller Argoviensis (1863: 95) ≡ *Sebastiania ditassoides* fo. *apiculata* (Müll.Arg.) Müller Argoviensis (1866: 1174) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. “inter Alegres et Rio São Francisco”, without date, *Riedel s.n.* (P!; isolecto: K!, P!).
- = *Microstachys sessilifolia* var. *glabrata* Müller Argoviensis (1863: 95) ≡ *Sebastiania ditassoides* var. *glabrata* (Müll.Arg.) Müller Argoviensis (1866: 1174) ≡ *Sebastiania ditassoides* var. *discolor* Pax & Hoffmann (1912: 115) – Lectotype (designated here): BRAZIL. Goias, “Guariroba au Morro Cubatão”, without date, *Glaziou 19851* (C!, isolecto: P!).
- = *Microstachys sessilifolia* var. *glabrata* fo. *hastata* Müller Argoviensis (1863: 95) ≡ *Sebastiania ditassoides* fo. *hastata* (Müll.Arg.) Müller Argoviensis (1866: 1174) – Lectotype (designated here): BRAZIL. Without gazetteer and date, *Sellow s.n.* (K!).
- = *Microstachys sessilifolia* var. *ledifolia* Müller Argoviensis (1863: 95) ≡ *Sebastiania ditassoides* var. *ledifolia* (Müll.Arg.) Müller Argoviensis (1866: 1175) – Type specimen: BRAZIL. Without gazetteer and date, *Sellow s.n.* (holo: B-destroyed).
- = *Microstachys sessilifolia* var. *parvifolia* Müller Argoviensis (1863: 95) ≡ *Sebastiania ditassoides* var. *parvifolia* (Müll.Arg.) Müller Argoviensis (1866: 1175) – Type specimen: BRAZIL. Without gazetteer and date, *Sellow s.n.* (holo: B-destroyed).
- = *Microstachys sessilifolia* var. *vellerifolia* Müller Argoviensis (1863: 95) ≡ *Sebastiania ditassoides* var. *vellerifolia* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 114) – Lectotype (designated here): BRAZIL. Without gazetteer and date, *Riedel s.n.* (P!).
- = *Sebastiania diamantinensis* Glaziou (1905: 632) – Type specimen: BRAZIL. Minas Gerais,

Diamantina, 1842, *Glaziou 19460* (holo: P!; iso: F!).

= *Sebastiania ditassoides* var. *villosa* Glaziou (1905: 632) – Lectotype (designated here): BRAZIL. Goiás, Serra das Divisões, without date, *Glaziou 22096* (K!, islecto: MPU!, P!).

= *Microstachys ditassoides* subsp. *villosa* Silva & Esser (2011: 19) – Type specimen: BRAZIL. Piauí, Rio Preto, September 1841, *Gardner 2954* (holo: K!; iso: BM!).

Subshrubs 10-120 cm tall, with xylopodium, hastate. Branches glabrous to strigose, hairs 0.5-1 mm long. **Leaves** discolor (due to the white hairs); petiole 1 mm long, glabrous to strigose, hairs 0.5-1 mm long; blade sagittate, 0.5-1.5 × 0.1-0.2(-0.5) cm, chartaceous, strigose, hairs 0.5-1 mm long, hyphodromous, 1 pair of marginal crateriform glands, 0.1 mm in diameter, base truncate to sagittate, margins repand and inconspicuously serrulate, revolute, denticles adpressed, 0.1 mm long, apex acute-mucronate; stipules ovate, 0.3 × 0.3 mm, glabrous. **Inflorescence** 2.5-7 cm long, axis puberulous, hairs ca 0.5 mm long; bracts 1 × 0.8 mm, stipitate glands 0.2 mm in diameter, apex acuminate-cuspidate, margin slightly lacerate, pistillate cymule 1. **Staminate flower** 1, sessile; sepals 0.5 × 0.3 mm, apex obtuse; stamens 0.2 mm long, anthers 0.2 mm long. **Pistillate flower** subsessile, pedicel 0.1 mm long; sepals 0.8 × 0.5 mm, eglandular, apex obtuse; ovary 1 × 1 mm, ornate, glabrous to pubescent; stigmas 1 mm long, free. **Fruit** subglobose, 0.4-0.5 × 0.5-0.6 cm, glabrous to pubescent, pedicellate, pedicel 0.5 mm long; sepals persistent, stigmas persistent; numerous horn-shaped appendages into two bands on each mericarp, 0.2 mm long; columella 5 mm long. **Seed** oblong, 2.5-3 × 2-2.5 mm, testa not spotted.

Distribution and habitat: — *Microstachys ditassoides* occurs in campos rupestres and cerrados of Bolívia and Central and northeastern Brazil at elevations of 750–1,300 m. The species occurs in: Caatinga, Cerrado and Chacoan phytogeographic provinces (Fig. 13, Table 1).

IUCN conservation assessment: — Least concern (LC): The species is abundantly found in rocky grasslands and Cerrado s. lat., from Brazil to Bolivia.

Nomenclatural notes: —Müller Argoviensis (1863) described *Microstachys sessilifolia* with four varieties and numerous syntypes, neither of them named or anoted as the typical one. Silva & Esser (2011) described a new subspecies for *M. ditassoides* with “Gardner 2954” as type, however this collection refers to the types of *Eriocaulon linearifolium* Körn. (holo: F!; iso: B!, BM!, E!, F!, G!, K!, LL!, NY!, US!).

Morphological notes: — Morphologically *Microstachys ditassoides* is recognized by its small leaves with sagittate to hastate base.

Additional specimens examined: — **BOLIVIA.** Santa Cruz: Angel Sandoval, 17°57'53" S, 59°01'33" W, 25 April 1997, *Fuentes, A.* 1773 (USZ).

BRAZIL. s.dat., *Burchell* 6097 (K); **Bahia:** Andaraí, 20 May 1989, *Silva, L.A.M.* 2811 *et al.* (CEPEC, SP); **Bahia:** Andaraí, 20 May 1989, *Silva, L.A.M.* 2811 *et al.* (CEPEC, UEC); **Bahia:** Mucugê, 8 October 1942, *Froés, R.L.* 20155 (K); **Bahia:** Palmeiras, 12°27'00" S, 41°28'20" W, 30 August 1994, *Poveda, A.* PCD 580 *et al.* (ALCB, SP); **Distrito Federal** 14 September 1964, *Irwin, H.S.* 6227 *et al.* (NY, SP); **Distrito Federal:** Brasília, 4 September 1977, *Allem, A.* 1081 *et al.* (CEN, SP); **Distrito Federal:** Planaltina, 4 November 1977, *Allem, A.* 1123 *et al.* (CEN, SP); **Distrito Federal:** Sobradinho, 14 September 1964, *Irwin, H.S.* 6227 (K); **Goias** 1896, *Glaziou, A.* 22096 (K); **Goias** 8 September 1894, *Glaziou, A.* 22097 (BM); **Goias:** Alto Paraíso, 19 November 1987, *Barbosa, A.A.A.* 181 *et al.* (SP); **Goias:** Anápolis, 17 October 1956, *Smith, L.B.* 4787 *et al.* (SP); **Goias:** Corumbá de Goias, 30 November 1965, *Irwin, H.S.* 10784 (K); **Goias:** Luziania, 11 December 1978, *Heringer, E.P.* 16116 (IBGE, SP); **Goias:** Niquelândia, 14°21'27" S, 48°24'20" W, 30 May 1996, *Fonseca, M.L.* 977 *et al.* (IBGE, SP); **Goias:** Pirenópolis, 17 January 1972, *Irwin, H.S.* 34443 (K); **Goias:** São Jorge, 14°10'19" S, 47°47'00" W, 20 January 2012, *Pscheidt, A.C.* 113 *et al.* (SP); **Mato Grosso** 1833, *Gaudichaud, C.* 239 (P); **Mato Grosso:** Chapada dos Guimarães, 15 September 1991, *Gottsberger, G.* 150991-1-5 *et al.* (SP); **Mato Grosso do Sul:** Corumbá, 18°01'18" S, 57°31'54" W, 20 October 2002, *Damasceno, G.A.* 2577 *et al.* (COR, SP); **Minas Gerais** , *Claussen, M.* s.n. (P); **Minas Gerais:** Jaboticatubas, 19°19' S, 43°36' W, 25 November 1965, *Eiten, G.* 6912 *et al.* (SP); **Minas Gerais:** Santana do Pirapama, 19°00'22" S, 43°45'21" W, 15 March 2009, *Zappi, D.C.* 2154 *et al.* (SP, SPF); **Minas Gerais:** Serra do Cipó, 19°16'39" S, 43°32'56" W, 16 July 2011, *Pscheidt, A.C.* 90 *et al.* (SP).

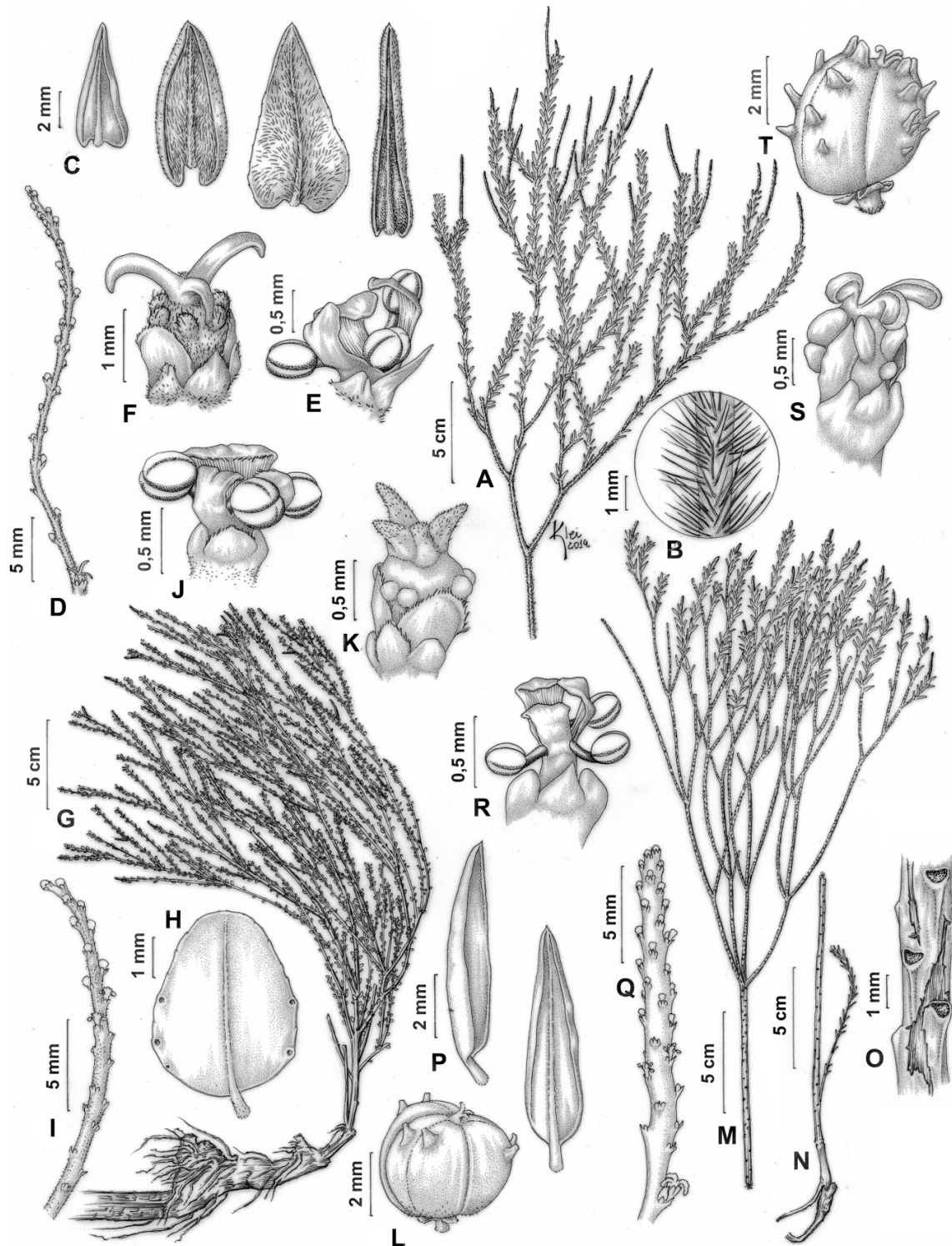


Figure 15. *Microstachys ditassoides*. A. Habit. B. Indument. C. Leaves variation. D. Inflorescence. E. Staminate flower. F. Pistillate flower (L.A. Mattos Silva 2811). *Microstachys nummularifolia*. G. Habit. H. Leaf. I. Inflorescence. J. Staminate flower. K. Pistillate flower. L. Fruit. (A.C. Pscheidt et al. 145). *Microstachys revoluta*. M. Habit. N. Detail of the branch. O. Leaves. P. Inflorescence. Q. Staminate flower. R. Pistillate flower. S. Fruit. (A.C. Pscheidt et al. 193).



Figure 16. Images of *Microstachys ditassoides*. 1. Habit. 2. Leaves. (A.C. Pscheidt) 3. Inflorescence. 4. Inflorescence with basal pistillate flowers. 5. Pistillate flower. 6. Fruit. (M.J. Silva).

***Microstachys glandulosa* (Martius & Zuccarini) Esser & M.J. Silva, Silva & Esser (2011: 19)**

(Fig. 2 F-K, 17)

- ≡ *Cnemidostachys glandulosa* Martius & Zuccarini (1824a: 139, 1824b: 71) ≡ *Sebastiania corniculata* var. *obtusifolia* fo. *glandulosa* (Mart.) Müller Argoviensis (1866: 1168) ≡ *Sebastiania corniculata* var. *obtusifolia* fo. *calvescens* Pax, Pax & Hoffmann (1912: 101) – Lectotype (designated by Silva & Esser 2011): BRAZIL. Minas Gerais, *in campis*, without date, *Martius s.n.* (M!; isolecto: M!).
- = *Stillingia campestris* Baillon (1858: 516) ≡ *Sebastiania corniculata* var. *campestris* (Baill.) Müller Argoviensis (1866: 1169) ≡ *Sebastiania glandulosa* var. *campestris* (Baill.) Pax, Pax & Hoffmann (1912: 101) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Without gazetteer and date, *Martius Herb. Fl. Bras. 907* (M!; isolecto: BM!, K!, L, M!, NY!, P!, W!, WU!).
- = *Sebastiania corniculata* var. *sellowiana* Müller Argoviensis (1866: 1169) ≡ *Sebastiania glandulosa* var. *sellowiana* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 102) – Lectotype (designated here): BRAZIL. “Rio de Janeiro et Campos”, without date, *Sellow s.n.* (K!, isolecto: P!, U!).
- = *Cnemidostachys velutina* Klotzsch ex Baill., Baillon (1858: 516) ≡ *Stillingia velutina* Baillon (1858: 516) ≡ *Sebastiania corniculata* fo. *velutina* Müller Argoviensis (1866: 1168) ≡ *Sebastiania glandulosa* fo. *velutina* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 101) – Lectotype (designated here): BRAZIL. Without gazetteer and date, *Sellow s.n.* (P!, isolecto: K!).
- = *Sebastiania corniculata* var. *parvifolia* Müller Argoviensis (1866: 1169) ≡ *Sebastiania glandulosa* var. *parvifolia* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 102) – Type specimen: BRAZIL. Without gazetteer and date, *Pohl 1700* (holo: W, iso: K!).
- = *Sebastiania corniculata* var. *scabra* Müller Argoviensis (1866: 1168) ≡ *Sebastiania glandulosa* var. *scabra* (Müll.Arg.) Pax, Pax & Hofmann (1912: 102) – Type specimen: BRAZIL. Minas Gerais, Caxoeira do Campo, without date, *Claussen 121* (holo: M!; iso: P!).
- = *Sebastiania corniculata* var. *sellowiana* fo. *fallax* Müller Argoviensis (1866: 1170) ≡ *Sebastiania corniculata* var. *fallax* (Müll.Arg.) Müller Argoviensis (1874: 553) ≡ *Sebastiania glandulosa* var. *fallax* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 102) – Type specimen: BRAZIL. “Rio de Janeiro et Campos”, without date, *Sellow 164* (holo:

B-destroyed).

- = *Sebastiania corniculata* var. *sellowiana* fo. *olfersiana* Müller Argoviensis (1866: 1170) ≡ *Sebastiania glandulosa* fo. *olfersiana* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 102) – Lectotype (designated here): BRAZIL. Espírito Santo, Vitória, without date, *Sellow s.n.* (K!).
- = *Sebastiania corniculata* var. *sellowiana* fo. *ovata* Müller Argoviensis (1866: 1169) ≡ *Sebastiania glandulosa* fo. *ovata* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 102) – Type specimen: BRAZIL. Without gazetteer and date, *Pohl 1723* (holo: W).
- = *Sebastiania corniculata* var. *sellowiana* fo. *glabrata* Müller Argoviensis (1866: 1170) ≡ *Sebastiania corniculata* var. *pohlii* Müller Argoviensis (1874: 553) ≡ *Sebastiania glandulosa* var. *pohlii* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 103) – Type specimen: BRAZIL. Minas Gerais, without date, *Pohl s.n.* (holo: W).
- = *Sebastiania corniculata* var. *microdendron* Müller Argoviensis (1874: 553) ≡ *Sebastiania glandulosa* var. *microdendron* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 102) – Type specimen: BRAZIL. Minas Gerais, Serra da Piedade, 30 January 1866, *Warming 1529 p.p.* (holo: C!).
- = *Sebastiania corniculata* var. *psilophylla* Müller Argoviensis (1874: 552) ≡ *Sebastiania glandulosa* var. *psilophylla* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 103) – Type specimen: BRAZIL. Rio de Janeiro, 1867, *Glaziou 729* (holo: BR!; iso: P!).
- = *Sebastiania corniculata* var. *transiens* Müller Argoviensis (1874: 553) ≡ *Sebastiania glandulosa* var. *transiens* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 102) – Type specimen: BRAZIL. Minas Gerais, Serra da Piedade, 30 January 1866, *Warming 1529 p.p.* (holo: C!).

Shrubs 80-150 cm tall, with xylopodium, erect. Branches pubescent, hairs 0.5-1 mm long. **Leaves** concolor; petiole 1-3 mm long, pubescent, hairs 0.5 mm long; blade ovate, often elliptic, 0.5-3.5 × 1-1.5 cm, chartaceous, glabrous to pubescent, hairs 0.5 mm long, brochidodromous, 2-8 pairs of marginal crateriform glands, often in marginal lobes, 0.1 mm in diameter, base obtuse to rounded, margin serrulate, plane, denticles adpressed, 0.2 mm long, apex obtuse to acute; stipules ovate, 1 × 1 mm, glabrous to pubescent. **Inflorescence** 1-3 cm long, axis glabrous to pubescent, hairs 0.2 mm long; bracts 1 × 1 mm, stipitate glands 0.1 mm in diameter, margin entire to slightly lacerate, pistillate cymule 1. **Staminate flower** 1, pedicellate, pedicel 0.2 mm long; sepals 1 × 0.5 mm, apex rounded; stamens 0.2 mm long,

anthers 0.2 mm long. **Pistillate flower** pedicellate, pedicel 0.2 mm long; sepals 1×1 mm, glandular, apex rounded; ovary 1×1 mm, ornate, glabrous to pubescent; stigmas 1 mm long, free. **Fruit** globose, 0.5×0.5 cm, glabrous to pubescent, pedicellate, pedicel 0.5 mm long; sepals persistent, stigmas persistent; numerous horn-shaped appendages on each mericarp, mostly apical, 0.5 mm long; columella 5 mm long. **Seed** oblong, 4×2 mm, testa non-spotted.

Distribution and habitat: — *Microstachys glandulosa* has a disjunct distribution between campos rupestres/cerrados from central and the restingas in southern Brazil at elevations of 0–1,480 m. This species occurs in the Atlantic and Cerrado phytogeographic provinces (Fig. 13, Table 1).

IUCN conservation assessment: — Least Concern (LC) due to its widespread distribution in Brazil and dense populations.

Nomenclatural notes: — This species was listed before as synonym of *Microstachys corniculata* (Govaerts *et al.* 2000) until its reestablishment by Silva & Esser (2011).

Morphological notes: — The species has distinct marginal glands better observed in young leaves, often arranged in small lobes.

Microstachys glandulosa is similar to *M. corniculata* and *M. hispida*. The elliptic to oval leaves with a petiole shorter than 3 mm long of *M. glandulosa* differ from the lanceolate leaves with a petiole longer than 3 mm long of *M. corniculata*. The fruit with appendages of *M. glandulosa* differ from the undeveloped appendages found in *M. hispida*.

Additional specimens examined: — **BRAZIL.** 1838, Claussen, *M.* 121 (P); **Bahia** 5 April 1965, Belem, *R.P.* 705 (K); **Bahia: Abaíra**, $13^{\circ}18' \text{ S}$, $41^{\circ}52' \text{ W}$, 18 November 1992, Ganev, *W.* 1505 (HUEFS, K, SP, SPF); **Bahia: Cocos**, $14^{\circ}14'45'' \text{ S}$, $44^{\circ}45'31'' \text{ W}$, 17 May 2001, França, *F.* 3638 *et al.* (HUEFS, SP); **Bahia: Feira de Santana**, 19 August 1996, Harley, *R.M.* 28460 (K); **Bahia: Formosa do Rio Preto**, $11^{\circ}08'40'' \text{ S}$, $45^{\circ}34'22'' \text{ W}$, 11 November 1997, Oliveira, *F.C.A.* 909 *et al.* (IBGE, SP); **Bahia: Lençóis**, 21 May 1980, Harley, *R.M.* 22257 (K); **Bahia: Morro do Chapéu**, 22 February 1993, Amorim, *A.M.* 1047 *et al.* (CEPEC, SP); **Bahia: Mucugê**, $13^{\circ}01' \text{ S}$, $41^{\circ}21' \text{ W}$, 4 February 1974, Harley, *R.M.* 15909 (M); **Bahia: Rio de Contas**, 13 November 1998, Silva, *M.M.* 147 *et al.* (HUEFS, SP); **Bahia: Seabra**, 23 February 1971, Irwin, *H.S.* 30767 (K); **Distrito Federal** 23 March 1942, Machado, *O.* 71320 (Z); **Espírito Santo: St. Hilaire**, *A.* B303 (P); **Espírito Santo: Sooretama**, 2 November 2011, Takeuchi, *C.* 93 *et al.* (SP); **Espírito Santo: Vila Velha**, 4 November 2011, Takeuchi, *C.* 96 *et al.* (SP); **Goiás** December 1892, Glaziou, *A.* 364 (P);

Goiás: Alvorada do Norte, 14°31'08" S, 46°34'40" W, 18 February 2003, *Mendonça, R.C.* 5220 *et al.* (IBGE, SP); **Goiás: Corumba de Goiás**, 7 February 1990, *Arbo, M.M.* 3843 (K); **Goiás: Goiás Velho**, 10 May 1973, *Anderson, W.R.* 10013 (K); **Goiás: Pirenópolis**, 14 January 1972, *Irwin, H.S.* 34113 (K); **Goiás: Serra Dourada**, January 1893, *Glaziou, A.* s.n. (P); **Mato Grosso** 20 January 1968, *Philcox, D.* 4140 (P); **Mato Grosso do Sul: Brazilândia**, 26 November 1992, *Catharino, E.L.M.* 1846 *et al.* (SP); **Minas Gerais** 18 February 1972, *Anderson, W.R.* 36207 (K); **Minas Gerais: Alto do Palácio**, November 1985, *Castro, N.M.* 541 (SP); **Minas Gerais: Alvorada de Minas**, 18°46' S, 43°27' W, 17 May 1990, *Arbo, M.M.* 4310 *et al.* (CTES, SP); **Minas Gerais: Betim**, 11 May 1945, *Williams, L.O.* 6237 (K); **Minas Gerais: Botumirim**, 16°49'49" S, 43°02'40" W, 22 December 2004, *Forzza, R.C.* 3815 *et al.* (RB, SP, SPF); **Minas Gerais: Caeté**, 19°54' S, 43°38' W, 14 May 1990, *Arbo, M.M.* 4100 (K); **Minas Gerais: Cardeal Mota**, 19°20' S, 43°35' W, 15 May 1990, *Arbo, M.M.* 4159 (K); **Minas Gerais: Couto Magalhães**, 26 February 1975, *Hatschbach, G.* 36509 *et al.* (Z); **Minas Gerais: Datas**, 18°28'13" S, 43°38'59" W, 13 March 1995, *Souza, V.C.* 8515 *et al.* (ESA, SP); **Minas Gerais: Diamantina**, 5 May 1994, *Brandão, M.* 24429 (PAMG); **Minas Gerais: Itabira**, *Claussen, M.* s.n. (P); **Minas Gerais: Itabirito**, 19 December 1970, *Krieger, P.L.* 9684 (CESJ, SP); **Minas Gerais: Itacambira**, 1 October 1997, *Mello-Silva, R.* 1496 *et al.* (SP, SPF); **Minas Gerais: Itacolumy**, 14 February 1884, *Glaziou, A.* 18454 (P); **Minas Gerais: Jaboticatubas**, 29 April 1952, *Smith, L.B.* 7003 (K); **Minas Gerais: Montes Claros**, 23 February 1969, *Irwin, H.S.* 23687 (B); **Minas Gerais: Santa Bárbara**, 17 December 1982, *Pirani, J.R.* 336 *et al.* (SP); **Minas Gerais: Santana do Riacho**, 16 May 2012, *Andrade, I.R.* 438 (BHZB, SP); **Minas Gerais: Santana do Pirapama**, 18°55' S, 43°54' W, 23 March 1982, *Cordeiro, I.* CFSC 8150 *et al.* (SP, SPF); **Minas Gerais: Serra do Caraça**, 26 July 1989, *Neto, S.R.* 874 *et al.* (SP); **Minas Gerais: Serra do Cipó**, 19°00'00" S, 43°35'56" W, 16 July 2011, *Pscheidt, A.C.* 89 *et al.* (SP); **Minas Gerais: São José do Barreiro**, 20°01'84" S, 46°03'14" W, 9 July 2009, *Silva, J.S.* 800 *et al.* (UEC); **Minas Gerais: Trinta Réis**, 27 January 1986, *Cordeiro, I.* s.n. (K); **Minas Gerais: Uberlândia**, 29 January 1990, *Arbo, M.M.* 3015 (K); **Piauí: Castelo**, 2 December 1979, *Fernandes, A.* s.n. (EAC); **Rio de Janeiro** 1843, *Weddell, M.H.A.* 549 (P); **Rio de Janeiro: Araruama**, 16 January 1974, *Amaral Júnior, A.* 1740 (BOTU, SP); **Rio de Janeiro: Cabo Frio**, August 1983, *Brade* 12761 (B); **Rio de Janeiro: Jacarepagua**, 3 May 1966, *Hunt, D.R.* 5424 (K); **Rio de Janeiro: Maricá**, *Souza, A.* s.n. (K); **Rio de Janeiro: Parati**, 30 March 1983, *Almeida, C.* 1948 (K); **Rio de Janeiro: Rio das Ostras**, 5 April 1971, *Krieger, P.L.* 10380 (CESJ, SP); **Rio de Janeiro: Rio de Janeiro**, 7 February 1964, *Hoehne, W.* 5579 *et al.* (SP); **São Paulo: Pedregulho**, 20°09'28" S, 47°16'38" W, 14 December 2003, *Sasaki, D.* 888 *et al.* (SP, SPF).

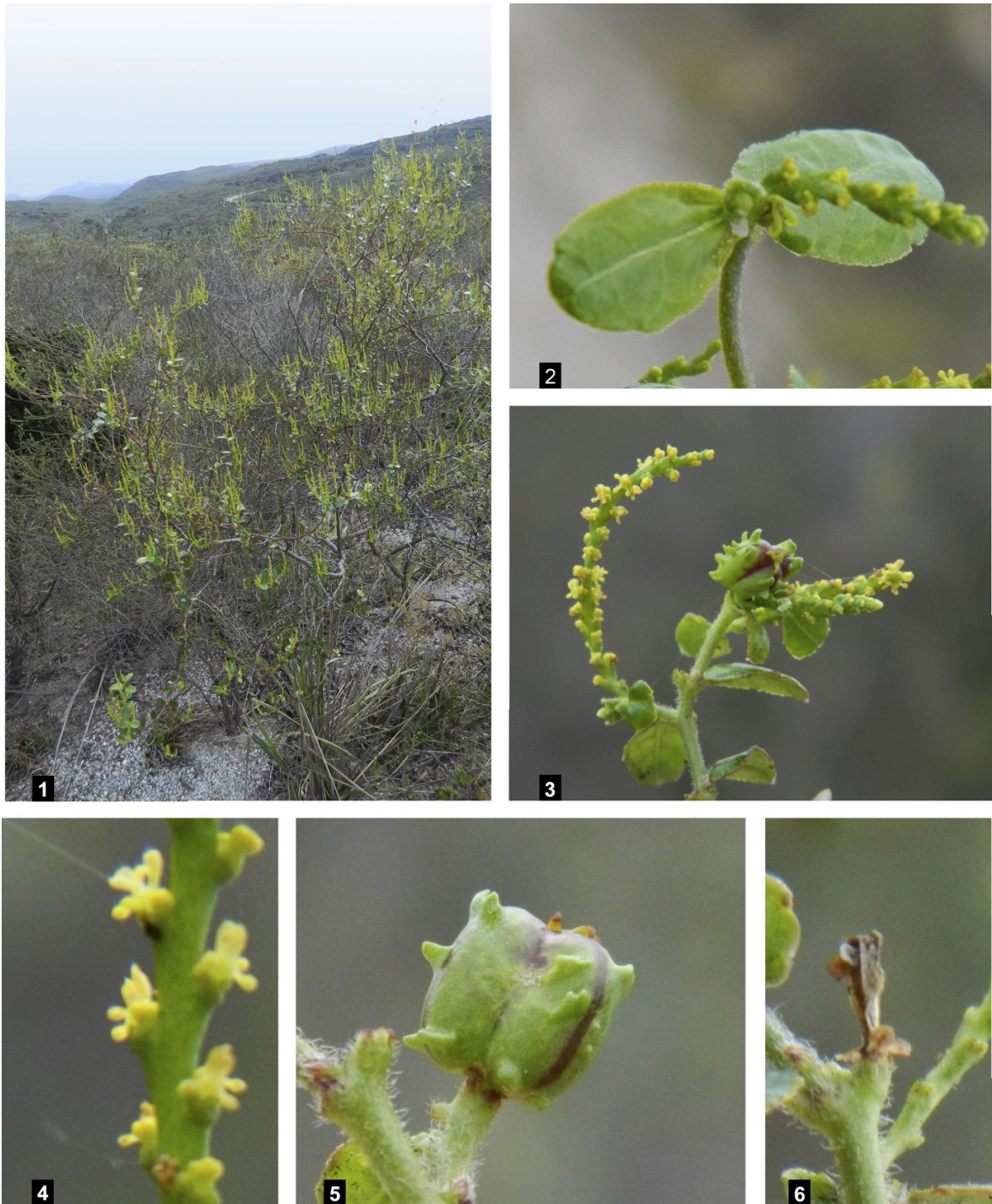


Figure 17. Images of *Microstachys glandulosa*. 1. Habit. 2. Leaves. 3. Inflorescences. 4. Staminate flowers. 5. Fruit. 6. Columella. (A.C. Pscheidt).

***Microstachys heterodoxa* (Müller Argoviensis) Esser (1999: 959)**

(Fig. 18 A-G, 19)

≡ *Stillingia heterodoxa* Müller Argoviensis (1863: 89) ≡ *Sebastiania heterodoxa* (Müll.Arg.)

Bentham (1880: 334) – Lectotype (designated by Esser 1999): BRAZIL. Bahia, Sierra Jacobina, without date, *Blanchet 3658* (G-DC!; isolecto: BM!, BR!, C!, K!, NY!, P!).

Shrubs, 80-100 cm tall, with xylopodium. Branches erect, indument floccose (with dendritic hairs), hairs ca. 0.5 mm long. **Leaves** discolor; petiole 2-5 mm long, flocculent, hairs 0.5 mm long; blade ovate to elliptic, 1-5 × 1-3.5 cm, chartaceous, flocculent, hairs 0.5 mm long, brochidodromous, 2-3(-8) pairs of marginal crateriform glands, 0.2 mm in diameter, base obtuse to rounded, margin serrulate, revolute, denticles adpressed, 0.5 mm long, apex obtuse to rounded; stipules ovate, 1 × 0.5 mm, flocculent. **Inflorescence** 1-8 cm long, spirally axis flocculent, hairs 0.5 mm long; bracts 0.5 × 0.5 mm, sessile glands 0.5 mm in diameter, margin entire, pistillate cymule 1. **Staminate flower** 1, pedicellate, pedicel 0.5 mm long; sepals 0.5 × 0.3 mm, apex rounded; stamens 0.2 mm long, anthers 0.2 mm long. **Pistillate flower** pedicellate, pedicel 0.3 mm long; sepals 1 × 1 mm, eglandular, apex rounded; ovary 1 × 1 mm, ornate, flocculent; stigma rounded, 1 mm long, free. **Fruit** oblong, 0.5-0.6 × 0.4-0.5 cm, flocculent, pedicellate, pedicel 0.8 mm long; sepals persistent, stigmas persistent; 1 pair of pyramidal appendages apically on each mericarp, 0.5 mm long; columella 5 mm long. **Seed** oblong, 3.5 × 2.5 mm, testa spotted.

Distribution and habitat: — *Microstachys heterodoxa* is endemic to the Brazilian State of Bahia and occurs disjunctly between Chapada Diamantina range, in campos rupestres and seashore plains, in coastal strand vegetation at elevations of 0–1,000 m, in Caatinga and Atlantic phytogeographic province (Fig. 20, Table 1).

IUCN conservation assessment: — Vulnerable (VU): the species has an extent of occurrence < 20,000 km² and < 10 locations in Bahia (Brazil), with continuing decline of its extent of occurrence due to the antropic occupation of Caatinga.

Morphological notes: — *Microstachys heterodoxa* is the only species in the genus that has a flocculent indumentum with dendritic trichomes.

Additional specimens examined: — BRAZIL. May 1866, *Blanchet 3658* (K); Bahia 3 April 1976, *Davidse, G. 11920 et al.* (SP); Bahia: Itaberaba, 1995, *Pignal 218* (P); Bahia: Ituberá, 13°25' S, 39°11' W, 10 June 2006, *Amorim, A.M. 6014 et al.* (CEPEC, SP); Bahia: Jacobina, 11°14'37" S, 40°30'55" W, 31 December 2004, *Forzza, R.C. 3901 et al.* (RB, SP,

SPF); **Bahia: Lençois**, 12°28' S, 41°26' W, 27 May 1980, *Harley, R.M.* 22694 (K); **Bahia: Maraú**, 9 May 1966, *Belem, R.P.* 2111 (K); **Bahia: Morro do Chapéu**, 26 April 1999, *Amorim, A.M.* 2960 *et al.* (CEPEC, SP); **Bahia: Palmeiras**, 12°27'52" S, 41°24'31" W, 22 November 2012, *Pscheidt, A.C.* 198 *et al.* (HUEFS, SP); **Bahia: Rio de Contas**, 13 September 2011, *Takeuchi, C.* s.n. *et al.* (SP); **Bahia: Rui Barbosa**, 12°18'36" S, 40°20'49" W, 14 March 1999, *França, F.* 2648 *et al.* (HUEFS, SP); **Minas Gerais: Joaquim Felício**, 17°42'26" S, 44°10'57" W, 24 March 2003, *Rodrigues, K.F.* 396 (UEC).

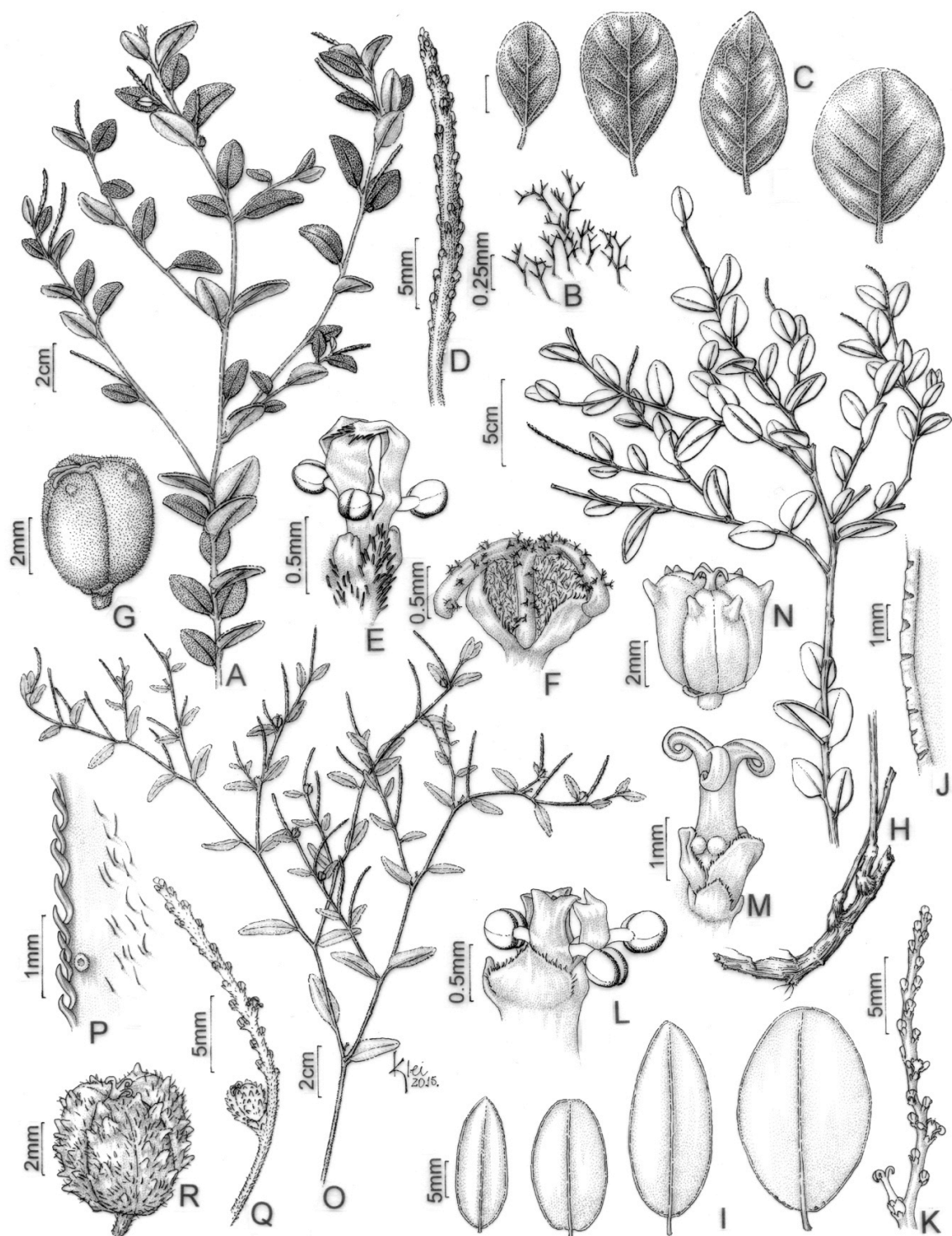


Figure 18. *Microstachys heterodoxa*. A. Habit. B. Dendritic hairs. (A.C. Pscheidt et al. 198). C. Leaves. (Junqueira 203, Ferreira 1827, A.C. Pscheidt et al. 198, Amorim 2960). D. Inflorescence. E. Staminate flower. F. Pistillate flower. G. Fruit (A.C. Pscheidt et al. 198). *Microstachys marginata*. H. Habit. (A.C. Pscheidt et al. 142). I. Leaves. (Bautista 3962, Hind 4148, Ganev 342, A.C. Pscheidt et al. 142). J. Margin of the leaf. K. Inflorescence. L. Staminate flower. M. Pistillate flower. N. Fruit. (A.C. Pscheidt et al. 142). *Microstachys serrulata*. O. Habit. P. Margin of the leaf. Q. Inflorescence. R. Fruit (M. Pastore 264).



Figure 19. Images of *Microstachys heterodoxa*. 1. Habit. 2. Leaf. 3. Staminate flowers. 4. Fruit. 5. Columella and young inflorescence covered by its bracts. (A.C. Pscheidt).

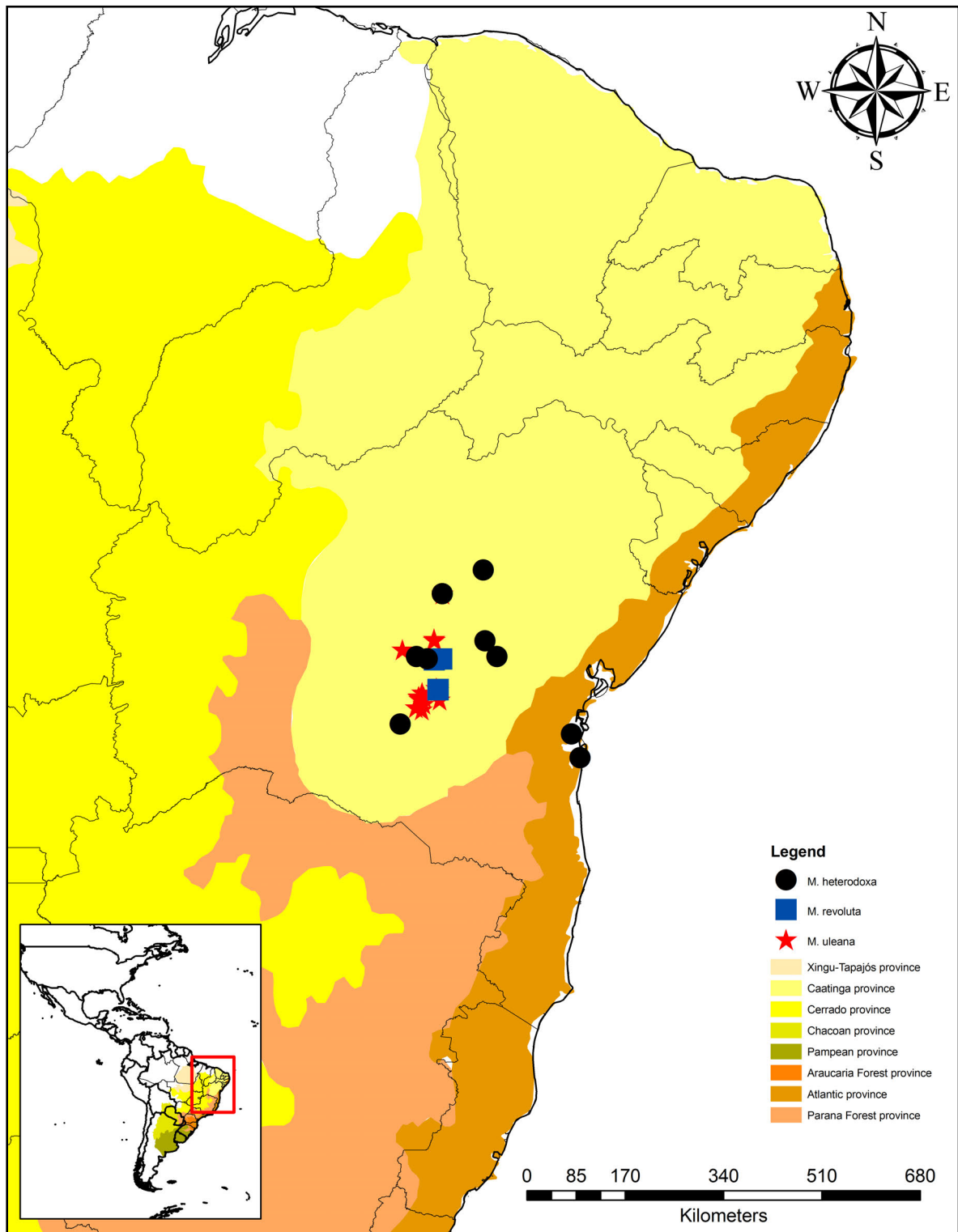


Figure 20. Distribution map of *Microstachys heterodoxa*, *M. revoluta* and *M. uleana*.

***Microstachys hispida* (Martius & Zuccarini) Govaerts, Govaerts *et al.* (2000: 1190)**

(Fig. 2 L-O)

- ≡ *Cnemidostachys hispida* Martius & Zuccarini (1824b: 71) ≡ *Sebastiania corniculata* var. *hispida* (Mart. & Zucc.) Müller Argoviensis (1866: 1172) ≡ *Sebastiania hispida* (Mart. & Zucc.) Pax, Pax & Hoffmann (1912: 105) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Minas Gerais, “habitat in campis”, without date, *Martius s.n.* (M!).
- = *Sebastiania corniculata* var. *leucoblepharis* Müller Argoviensis (1866: 1172) ≡ *Sebastiania hispida* var. *leucoblepharis* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 110) – Type specimen: BRAZIL. Without gazetteer and date, *Sellow 5084* (holo: B-destroyed).
- = *Sebastiania corniculata* var. *tomentosa* Müller Argoviensis (1866: 1171) ≡ *Sebastiania hispida* var. *tomentosa* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 109) – Type specimen: BRAZIL. Minas Gerais, Tejuco, 1833, *Vauthier 87* (holo: G-DC; iso: GH!, L!, W!).
- = *Sebastiania corniculata* var. *ferruginea* Müller Argoviensis (1874: 555) ≡ *Sebastiania hispida* var. *ferruginea* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 107) – Type specimen: BRAZIL. Minas Gerais, Serra da Piedade, without date, *Warming 1528/2* (holo: C!; iso: C!, P!).
- = *Sebastiania corniculata* var. *megapontica* Müller Argoviensis (1874: 559) ≡ *Sebastiania hispida* var. *megapontica* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 108) ≡ *Sebastiania hispida* fo. *villosula* Pax, Pax & Hoffmann (1912: 109) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Goias, Megaponte, without date, *Pohl 956* (W!).
- = *Sebastiania corniculata* var. *incana* Müller Argoviensis (1874: 557) ≡ *Sebastiania hispida* var. *incana* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 107) – Type specimen: BRAZIL. Minas Gerais, Serra da Piedade, 17 February 1864, *Warming 1539* (holo: HBG; iso: C!).
- = *Sebastiania corniculata* var. *laeta* Müller Argoviensis (1874: 559) ≡ *Sebastiania hispida* var. *laeta* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 109) – Type specimen: BRAZIL. Minas Gerais, Serra da Piedade, without date, *Warming 1524* (holo: C!; iso: C!, P!).
- = *Sebastiania corniculata* var. *lagoensis* Müller Argoviensis (1874: 557) ≡ *Sebastiania hispida* var. *lagoensis* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 107) – Type specimen: BRAZIL. Minas Gerais, “ad Fazenda Fidalgo prope Lagoa Santa”, 16 January 1866, *Warming 1527* (holo: C!).

- = *Sebastiania corniculata* var. *occidentalis* Müller Argoviensis (1874: 557) ≡ *Sebastiania hispida* var. *occidentalis* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 107) – Type specimen: BRAZIL. “Brasilia occidentalis”, without date, *Tamberlik s.n.* (holo: W!).
- = *Sebastiania corniculata* var. *petiolaris* Müller Argoviensis (1874: 561) – Type specimen: BRAZIL. “Brasilia occidentalis”, without date, *Tamberlik s.n.* (holo: W!).
- = *Sebastiania corniculata* var. *oligophylla* Müller Argoviensis (1874: 556) ≡ *Sebastiania hispida* var. *oligophylla* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 107) – Type specimen: BRAZIL. Pará, “prope Santarem”, without date, *Spruce 327* (holo: M!; iso: BM!, E!, G!, K!, NY!, TCD!).
- = *Sebastiania corniculata* var. *regnellii* Müller Argoviensis (1874: 558) ≡ *Sebastiania hispida* var. *regnellii* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 106) – Type specimen: BRAZIL. São Paulo, Retiro da Lagem da Villa de Cajieru, without date, *Regnell 1056* (holo: M!).
- = *Sebastiania corniculata* var. *weddelliana* Müller Argoviensis (1874: 558) ≡ *Sebastiania hispida* var. *weddelliana* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 109) – Type Lectotype (designated here): BRAZIL. Minas Gerais, November 1843, *Weddell 1340* (P!).
- = *Sebastiania corniculata* var. *hassleriana* Chodat (1901: 398) – Type specimen: PARAGUAY. “Cordillere dos Altos”, without date, *Hassler 1583* (holo: G; iso: K!).
- = *Sebastiania hispida* var. *ambigua* Pax & Hoffmann (1912: 110) – Type specimen: PARAGUAY. Tobaty, without date, *Hassler 6235* (holo: BM!).
- = *Sebastiania hispida* var. *aspera* Pax & Hoffmann (1912: 109) – Lectotype (designated here): PARAGUAY. “Oberlauf des Apaflusses”, without date, *Hassler 8227* (BM!, isoelecto: K!, S!).
- = *Sebastiania hispida* var. *megapontica* fo. *brevipila* Pax, Pax & Hoffmann (1912: 109) – Type specimen: PARAGUAY. “Zwischen Rio Apa un Aquidaban”, without date, *Fiebrig 4254 p.p.* (holo: B-destroyed).
- = *Sebastiania hispida* var. *megapontica* fo. *glabrescens* Pax, Pax & Hoffmann (1912: 109) – Lectotype (designated here): PARAGUAY. Alto Paraguay, Chaco, without date, *Fiebrig 1272* (Z!).
- = *Sebastiania graciliramea* Pax (1910: 162) ≡ *Sebastiania hispida* var. *graciliramea* (Pax & K.Hoffm.) Pax & Hoffmann (1912: 107) – Type: BRAZIL. Rio Grande do Sul,

“Estancia Lourenço Gomez bei N.Wttbg.”, 6 December 1904, *Bornmüller 360* (holo: B-destroyed, iso: JE-image!, M!)

= *Sebastiania hispida* var. *stenophylla* Pax & Hoffmann (1912: 107) – Lectotype (designated here): BRAZIL. “Felsen bei Caraça”, without date, *Ule 2684* (HBG!).

= *Sebastiania hispida* var. *cuyabensis* Pax & Hoffmann (1924: 200) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Mato Grosso, without date, *Malme s.n.* (S!).

Subshrubs 50-150 cm tall, without xylopodium, erect. Branches hispid, hairs 2 mm long. **Leaves** slightly discolor; petiole 5-10 mm long, hispid, hair 2 mm long; blade lanceolate, 1.5-5 × 0.5-2 cm, chartaceous, hispid, hairs ca. 2 mm long, brochidodromous, 1-2 pairs of submarginal discoid glands, 0.5 mm in diameter, base cuneate to obtuse, margin serrulate, plane, denticles adpressed, 0.5 mm long, apex acute to obtuse; stipules ovate, 0.5 × 0.5 mm, hispid. **Inflorescence** 3-4 cm long, pubescent, hairs 0.5 mm long; bracts 0.5 × 0.5 mm, sessile glands 0.2 mm in diameter, margin lacerate, pistillate cymule 1. **Staminate flower** 2-3, subsessile, pedicel 0.1 mm long; sepals 0.5 × 0.4 mm, apex rounded; stamens 0.2 mm long, anthers 0.2 mm long. **Pistillate flower** subsessile, pedicel 0.1 mm long; sepals 1 × 1 mm, eglandular, apex acuminate; ovary 1 × 1 mm, ornate, hispid; stigmas 1 mm long, free. **Fruit** globose, 0.5-0.6 × 0.5-0.6 cm, hispid, pedicellate, pedicel 0.5 mm long; sepals persistent, stigmas persistent; 1 pair of horn-shaped appendages in the apex and base of each mericarp, ca. 0.5 mm long; columella ca. 5 mm long. **Seed** oblong, 4 × 2 mm, testa non-spotted.

Distribution and habitat: — *Microstachys hispida* occurs throughout the Chacoan subregion in cerrado, campo rupestre and coastal strand vegetation in Argentina, Bolivia, Brazil and Paraguay, in the Chacoan Subregion (Bahia, Distrito Federal, Goias, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Parana, Pernambuco, Santa Catarina, São Paulo and Rio Grande do Sul) and Paraguay, at elevations of 100–1,500 m. (Fig. 21, Table 1).

IUCN conservation assessment: — Least Concern (LC) due to its widespread distribution in Brazil and dense populations.

Morphological notes: — *Microstachys hispida* has hispid ovary and fruit. The leaves have submarginal discoid glands and the pistillate sepals are acuminate.

Additional specimens examined: — ARGENTINA. **Corrientes** 3 December 1980, *Eskuche, U.* 2783-46 (Z); **Corrientes: Dep. Capital**, 10 January 1976, *Schinini, A.* 12399 *et al.* (CTES, SI); **Corrientes: Ituzaingó**, 8 December 1973, *Krapovickas, A.* 23839 (P); **Corrientes: Paso de los Libres**, 15 December 1974, *Burkart, A.* 30932 (K); **Corrientes:**

Tres Cerros, 8 November 1936, *Burkart, A.* 8099 (SI); **Misiones: San Pedro**, 19 February 2005, *Belgrano, M.J.* 393 (SI); **Misiones: Bernardo de Irigoyen**, 17 February 1973, *Krapovickas, A.* 23374 (P); **Salta: Santa Victoria**, 17 March 1985, *Novara, L.* 5327 (Z).

BOLIVIA. 1847, *Bridges, T.* s.n. (BM); **Monteagudo**, 19 November 1927, *Troll, C.* 634 (B); **Pinos bei Tarija**, 12 March 1904, *Fiebrig, K.* 3139 A (Z); **Beni: Beni**, 14°26'52" S, 67°31'36" W, 21 October 2003, *Fuentes, A.* 5550 (K); **Beni: Mamoré**, 7 November 1993, *Moraes, M.* 1627 (DAV, LPB); **Beni: San Lorenzo**, 11°01' S, 65°44' W, 19 January 1999, *Maas, P.J.* 8717 (K); **Chuquisaca: Siles**, 9 March 1998, *Wood, J.R.I.* 13298 (K); **Cordillera** 20°05'16" S, 61°55'19" W, 17 July 1998, *Fuentes, A.* 2611 (MO, USZ); **La Paz: Sud Yungas**, 14 July 1979, *Beck, S.G.* 1749 (LPB); **Monteagudo** 19 November 1927, *Troll, C.* 634 (M); **Santa Cruz** 28 October 1980, *Zuloaga, F.O.* 1514 (MO); **Santa Cruz: Andres Ibanez**, 17°41' S, 63°25' W, 30 November 1988, *Nee, M.* 37002 (MO, NY); **Santa Cruz: Angel Sandoval**, 16°63'37" S, 59°12'37" W, 16 November 2008, *Wood, J.R.I.* 25380 *et al.* (UB); **Santa Cruz: Buenavista**, 22 August 1924, *Steinbach, J.* 6361 (K); **Santa Cruz: Chiquitos**, 18°19' S, 60°63' W, 11 November 1996, *Jardim, A.* 3655 (M); **Santa Cruz: Cordillera Province**, 20°05'16" S, 61°55'19" W, 17 July 1998, *Fuentes, A.* 2611 *et al.* (CTES); **Santa Cruz: Ibáñez**, 17°32'23" S, 63°16'18" W, 2 December 2005, *Nee, M.* 53606 (NY, SP); **Santa Cruz: Ichilo**, 17°23' S, 63°40' W, 31 October 1990, *Nee, M.* 39644 (MO); **Santa Cruz: Nuflo de Chavez**, 16°07' S, 62°03' W, 28 December 1986, *Nee, M.* 33369 (MO); **Santa Cruz: Sara**, 17°19' S, 63°20' W, 7 November 1990, *Nee, M.* 39738 (MO, NY); **Santa Cruz: Vallegrande**, 18°33'00" S, 63°59'30" W, 5 February 1988, *Nee, M.* 36195 (MO, NY); **Santa Cruz: Velasco**, 20 November 1987, *Bruderreck, B.* 29 (M); **Santa Cruz de La Sierra** November 1845, *Weddell, M.H.A.* 3578 (P).

BRAZIL. 1842, *Dupré, M.* D68 (P); **Bahia: Abaíra**, 31 October 1993, *Ganev, W.* 2376 (K); **Bahia: Espigão Mestre**, 3 March 1971, *Irwin, H.S.* 31365 (K); **Bahia: Piatã**, 13°18'42" S, 41°33'45" W, 8 January 2006, *Nunes, T.S.* 1466 *et al.* (HUEFS, SP); **Bahia: Rio de Contas**, 13°36' S, 41°50' W, 28 March 1977, *Harley, R.M.* 20110 (K); **Distrito Federal** 24 February 1970, *Irwin, H.S.* 26578 *et al.* (MBM); **Distrito Federal: Brasília**, 12 October 1965, *Heringer, E.P.* 10638 (K); **Distrito Federal: Chapada da Contagem**, 5 February 1987, *Pirani, J.R.* 1619 *et al.* (K, SP, SPF); **Distrito Federal: Paranoá**, 24 February 1970, *Irwin, H.S.* 26578 *et al.* (MBM); **Distrito Federal: Sobradinho**, 5 October 1965, *Irwin, H.S.* 8980 (K); **Goias** 2 May 1966, *Irwin, H.S.* 15571 *et al.* (NY, SP); **Goias: Corumba de Goias**, 27 January 1968, *Irwin, H.S.* 19260 (K); **Goias: Monte Alegre**, 12 March 1973, *Anderson, W.R.* 6927 (K); **Goias: Pirenópolis**, 15°47'35" S, 48°50'05" W, 19 January 2005, *Paula-Souza, J.* 4233 *et al.* (ESA, SI); **Goias: Posse**, 14°03'06" S, 46°19'01" W, 8 March 2001,

Fonseca, M.L. 2490 *et al.* (IBGE, SP); **Goiás: Formosa**, 2 May 1966, *Irwin, H.S.* 15571 (K); **Mato Grosso** 1833, *Gaudichaud, C.* 249 (P); **Mato Grosso: Corumbá**, 18°11' S, 55°46' W, 4 March 1967, *Bommer, D.F.R.* 35 (SP); **Mato Grosso do Sul: Anastacia**, 17 May 1970, *Hatschbach, G.* 24324 (MBM); **Mato Grosso do Sul: Miranda**, 16 July 1990, *Conceição, C.A.* 2655 (SP); **Mato Grosso do Sul: Piraputanga**, 29 September 1994, *Arbocz, G.F.* 801 (HPL, SP); **Minas Gerais** 1842, *Claussen, P.* 162 (K); **Minas Gerais: Caraça**, 18 February 1884, *Glaziou, A.* 15405 (P); **Minas Gerais: Conceição do Mato Dentro**, 19°05'58" S, 43°34'39" W, 30 May 2003, *Mota, R.C.* 2138 (BHCB); **Minas Gerais: Datas**, 18°28'12" S, 43°38'58" W, 13 March 1995, *Souza, V.C.* 8515 *et al.* (BHCB); **Minas Gerais: Diamantina**, 9 April 1973, *Anderson, W.R.* 8349 (K); **Minas Gerais: Grão Mogol**, 16°39'14" S, 42°59'20" W, 21 June 2012, *Pscheidt, A.C.* 143 *et al.* (SP); **Minas Gerais: Itabirito**, 19 December 1970, *Krieger, P.L.* 9665 pro parte (SP); **Minas Gerais: Lagoa Santa**, , *Warming* s.n. (P); **Minas Gerais: Ouro Preto**, 31 January 1971, *Irwin, H.S.* 29503 (K); **Minas Gerais: Ouro Fino**, s.dat., *Pohl* 1718 (K); **Minas Gerais: Santa Bárbara**, 12 December 1978, *Leitão-Filho, H.F.* 9515 (BM); **Minas Gerais: Serra do Itibirito**, 10 February 1968, *Irwin, H.S.* 19790 *et al.* (NY, SP); **Minas Gerais: Serro-Datas**, 2 July 1980, *Ferreira, M.B.* 9015 (PAMG); **Minas Gerais: São Gonçalo do Rio Abaixo**, 21 March 1992, *Sthemmann, J.R.* BHCB 27701 *et al.* (Z); **Minas Gerais: São João da Chapada**, 22 March 1970, *Irwin, H.S.* 28093 (K); **Minas Gerais: São Roque de Minas**, 9 November 2002, *Lima, L.R.* 211 *et al.* (SP, SPF); **Minas Gerais: Viçosa**, 31 December 1929, *Mexia, Y.* 4191 (BM); **Paraná: Arapoti**, 10 March 1960, *Hatschbach, G.* 6899 (L); **Paraná: Cianorte**, 28 April 1966, *Hatschbach, G.* 14233 (K); **Paraná: Guarapuava**, 16 May 1975, *Hatschbach, G.* 39911 *et al.* (Z); **Paraná: Guaratuba**, 9 May 1974, *Hatschbach, G.* 34424 (Z); **Paraná: Lapa**, 19 February 1978, *Lourteig, A.* 3163 (P); **Paraná: Sengés**, 11 December 1967, *Mattos, J.* 15294 *et al.* (SP); **Paraná: Tibagi**, 10 February 2004, *Carmo, M.R.B.* 722 (SP); **Pernambuco: Buíque**, 8 May 1995, *Gomes, A.P.S.* 309 (K); **Rio Grande do Sul: Bocó dos Faria**, 8 May 1950, *Rambo, B.* s.n. (P); **Rio Grande do Sul: Furna do Tigre**, 19 November 1949, *Rambo, B.* 44425 (P); **Rio Grande do Sul: Palmeira**, 31 January 1952, *Rambo, B.* 51938 (B); **Rio Grande do Sul: Santa Maria**, 25 November 1955, *Camargo, O.* 62 (B); **Rio Grande do Sul: Torres**, 9 January 1987, *Silveira, N.* 3812 (HAS, SP); **Santa Catarina: Chapecó**, 26 December 1956, *Smith, L.B.* 9344 (B, HBR); **Santa Catarina: Chapecó**, 21 February 1957, *Smith, L.B.* 11565 (K); **São Paulo: Bananal**, 22°48' S, 44°27' W, 15 December 2006, *Lima, L.R.* 413 *et al.* (SP); **São Paulo: Cunha**, 29 March 1994, *Baitello, J.B.* 502 (SP); **São Paulo: Itararé**, 24°05'06" S, 49°12'06" W, 14 November 1994, *Souza, V.C.* 7260 *et al.* (ESA, SP, SPF, UEC); **São Paulo: Itirapina**, 22°15'05" S, 47°53'05" W, 30 November 1961, *Eiten, G.*

3416 (K); **São Paulo: Pedregulho**, 20°09'28" S, 47°16'38" W, 14 December 2003, *Sasaki, D.* 888 *et al.* (SP, SPF); **São Paulo: Rancharia**, 22°22'56" S, 51°05'41" W, 14 February 1996, *Souza, V.C.* 10958 *et al.* (ESA, PEURF, SP, UEC); **São Paulo: Salesópolis**, 4 September 1994, *Rossi, L.* 1642 *et al.* (ESA, HRCB, SP, SPF, UEC).

PARAGUAY. February 1874, *Balansa, B.* 1733 (K); **Asuncion: Padino**, 23 November 1945, *Teague, G.W.* 601 (BM); **Caaguazu** November 1874, *Balansa, B.* 1733b (P); **Caazapá** 261501°00' S, 554554°00' W, 13 December 1999, *Zardini, E.M.* 52783 *et al.* (M, SP); **Caazapa: Taya-i**, 261501°00' S, 554554°00' W, 13 December 1999, *Zardini, E.M.* 52783 (M); **Canendiyu: Mbaracayu Natural Reserve**, 241116°00' S, 551645°00' W, 15 January 1998, *Zardini, E.M.* 47975 *et al.* (M, SP); **Canendiyu: Mbaracayu**, 241116°00' S, 551645°00' W, 15 January 1998, *Zardini, E.M.* 47975 (M); **Canendiyú** 235939°00' S, 552844°00' W, 31 October 1998, *Zardini, E.M.* 49439 (B); **Canindeyú: Lagunita**, 27 June 1996, *Marín, G.* 276 (BM, CTES, PY); **Concepcion** 221028°00' S, 573108°00' W, 14 January 2000, *Zardini, E.M.* 53704 (AS, MO, P); **Concepcion: Concepcion**, 23 October 1991, *Degen, R.* 2228 (FCQ, MO); **Concepcion: Loreto**, 23°16' S, 57°11' W, 18 November 1993, *Zardini, E.M.* 37318 *et al.* (M, SP); **Concepcion: Paso Horqueta**, 23°13' S, 57°11' W, 17 March 1994, *Zardini, E.M.* 39029 *et al.* (M, SP); **Gran Chaco: Santa Elisa**, December 1903, *Hassler, E.* 2648 (BM); **Itapua: Yacyreta**, 272656°00' S, 564923°00' W, 1 December 2000, *Zardini, E.M.* 55445 (M); **Maracayu** 1899, *Hassler, E.* 4902 (BM); **Misiones: San Miguel**, 262859°00' S, 570410°00' W, 30 November 2000, *Zardini, E.M.* 55419 *et al.* (M, SP); **Misiones: Yabebiry**, 272304°00' S, 570946°00' W, 3 December 2000, *Zardini, E.M.* 55861 *et al.* (M, SP); **Nueva Asunción: Ruta Trans Chaco**, 20°39' S, 62°00' W, 12 December 1987, *Schinini, A.* 25703 *et al.* (SI); **Paraguari: Cerro Lima**, 26°02' S, 57°24' W, 22 December 1993, *Zardini, E.M.* 37606 (M); **Paraguari: Salto Piraretá**, March 1972, *Schinini, A.* 4386 (P); **Presidente Hayes: Isla Poí**, 22°28' S, 59°40' W, 16 May 1994, *Krapovickas, A.* 45496 *et al.* (CTES); **San Pedro** 17 March 1983, *Simonis, J.E.* 62 *et al.* (Z); **San Pedro: Guayaybi**, 17 March 1983, *Simonis, J.E.* 62 (K); **San Pedro: Primavera**, 4 March 1955, *Woolston, A.L.* 471 (B, K); **San Pedro: Primavera**, 8 December 1957, *Woolston, A.L.* 926 (K); **San Pedro: Tacuara**, 24°22' S, 56°24' W, 21 October 1994, *Krapovickas, A.* 45794 (K); **Santa Elisa** December 1903, *Hassler, E.* 2648 (P); **Yerbales**, *Hassler, E.* 4902 (P); **Ypacaray** 1913, *Hassler, E.* 11491 (BM).

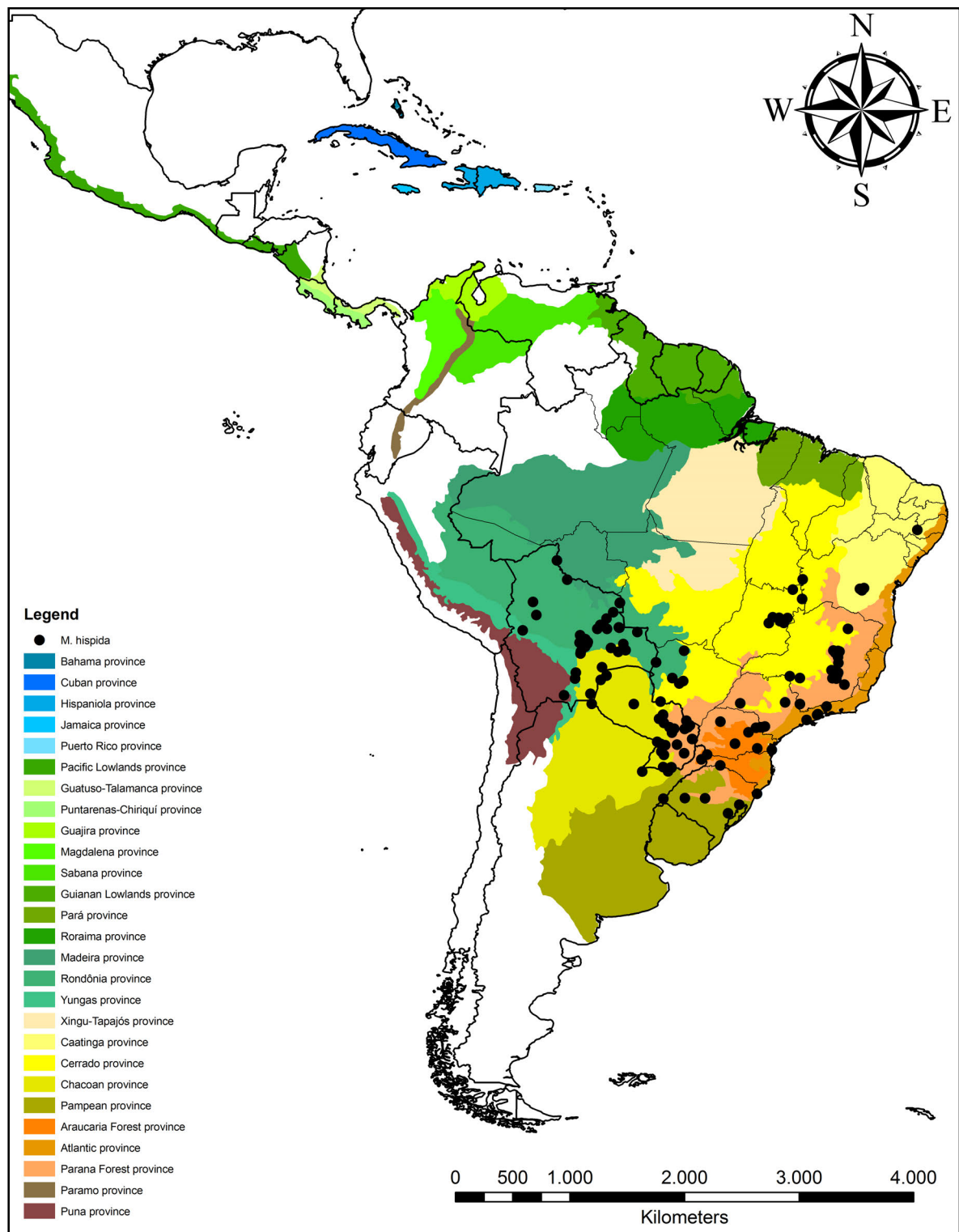


Figure 21. Distribution map of *Microstachys hispida*.

***Microstachys liliputiana* M.J. Silva, Pscheidt & Cordeiro (in press)**

– Type specimen: BRAZIL. Goiás, Parque Nacional da Chapada dos Veadeiros, Serra do Pouso Alto, 13 October 2013, *M.J. Silva et al.* 4500 (holo: UFG!, iso: CEN!).

Subshrubs 4.5-15 cm tall, with xylopodium, caespitose. Branches glabrous to strigulose, hairs 0.2 mm long. **Leaves** concolor; petiole 2-5 mm long, glabrescent, hairs 0.2 mm long; blade spatulate, 0.6-1.6 × 0.3-4.2 cm, carnose, glabrous, brochidodromous, marginal glands sparse, 0.1 mm in diameter, base cuneate, margin entire, plane, apex obtuse; stipules deltoid, 1 × 1 mm, glabrous. **Inflorescence** 1-3 cm long, axis glabrous; bracts 0.4-0.5 × 0.6-1.0 mm, basal sessile glands 0.2 mm in diameter, apex acute, margin lacerate, pistillate cymule 1. **Staminate flower** 1-3, pedicellate, pedicel 0.2-0.3 mm long; sepals 0.8-1.1 × 0.4-0.5 mm, apex obovate; stamens 0.6 mm long, anthers 0.3-0.4 mm long. **Pistillate flower** sessile; sepals 0.5-1 × 0.4-0.9 mm, eglandular, apex obtuse; ovary 1.7-1.8 × 1.4-1.5 mm, ornate, glabrous; stigmas 2.2-2.5 mm long, connate at base. **Fruit** oblong, 2.9-3 × 2.9-5 mm, glabrous, sessile; sepals non-persistent, stigmas persistent; 1 pair of horn-shaped appendages on each mericarp, ca. 0.5 mm long; columella 3 mm long. **Seed** globose, 1.9-2 × 3.6-3.8, testa spotted.

Distribution and habitat: — This species is endemic to Chapada dos Veadeiros National Park in Goiás State (Brazil) in the Cerrado phytogeographic province (Fig. 3, Table 1).

IUCN conservation assessment: — Critically Endangered (CR) due to its restricted area of occurrence and very small population.

Morphological notes: — *Microstachys liliputiana* is the only species in the genus *Microstachys* with carnose leaves.

Additional specimens examined: — BRAZIL. Goiás: Alto Paraíso de Goiás, Parque Nacional da Chapada dos Veadeiros, 12 November 1996, *M.A. da Silva & A.J.V. dos Santos* 3229 (IBGE, SP!). **Cavalcante**, Parque Nacional Chapada dos Veadeiros, 13°56'31.03"S, 47°29'54.84"W, 1078 m, 4 March 2012, *M.J.Silva et al.* 4126 (UFG). **São João d'Aliança**, Parque Nacional Chapada dos Veadeiros, 15.XI.2007, *J.F.B. Pastore et al.* 2311 (HUEFS).

***Microstachys marginata* (Martius & Zuccarini) Klotzsch ex Müller Argoviensis, Müller Argoviensis (1863: 90)**

(Fig. 18 H-N, 22)

≡ *Cnemidostachys marginata* Martius & Zuccarini (1824a: 137, 1824b: 68) ≡ *Sebastiania marginata* (Mart.) Müller Argoviensis (1866: 1166) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Minas Gerais, “in campis districtum adamantum”, without date, *Martius s.n.* (M!; isolecoto: M!).

= *Cnemidostachys coriacea* Martius & Zuccarini (1824a: 139, 1824b: 71) ≡ *Microstachys marginata* var. *minor* Müller Argoviensis (1863: 90) ≡ *Sebastiania marginata* var. *minor* (Müll.Arg.) Müller Argoviensis (1866: 1166) ≡ *Stillingia coriacea* (Mart. & Zucc.) Baillon (1865: 328) ≡ *Sebastiania marginata* var. *coriacea* (Mart. & Zucc.) Pax, Pax & Hoffmann (1912: 92) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Minas Gerais, “in montosis apricis”, without date, *Martius s.n.* (M!).

Subshrubs 30-100 cm tall, with xylopodium, erect. Branches ecostate, glabrous, slightly branched. **Leaves** concolor; petiole 2-5 mm long, glabrous; blade elliptic to large-elliptic, 1.5-4.5 × 1-3 cm, coriaceous, glabrous, hyphodromous, 1-3 pairs of submarginal patelliform glands, 0.5 mm in diameter, base rounded-retuse, margin entire, thickened, plane to revolute, apex rounded-mucronate to obtuse-mucronate; stipules acute, 0.5 × 0.3 mm, glabrous. **Inflorescence** 2-6 cm long, axis glabrous; bracts 0.5 × 0.5 mm, eglandular, margin lacerate, pistillate cymule 1. **Staminate flower** 1(-2), subsessile, pedicel 0.2 mm long; sepals 1 × 0.5 mm, apex incised; stamens 0.2 mm long, anthers 0.5 mm long. **Pistillate flower** subsessile, pedicel 0.2 mm long; sepals 1.2 × 1 mm, eglandular, apex acuminate; ovary 1 × 1 mm, ornate, glabrous; stigmas rounded 2 mm long, connate at base. **Fruit** globose, 0.5-0.7 × 0.5-0.6 cm, glabrous, pedicellate, pedicel 1 mm long; sepals persistent, stigmas non-persistent; 1 pair of horn-shaped appendages on the apex of each mericarp, 0.5 mm long; columella 5 mm long. **Seed** oblong, 4 × 3 mm, testa non-spotted.

Distribution and habitat: — *Microstachys marginata* is restricted to the states of Bahia and Minas Gerais in Cerrado, at elevations of 1,050–1,550 m, in Caatinga and Cerrado phytogeographic provinces (Fig. 3, Table 1).

IUCN conservation assessment: — Vulnerable (VU): the species has area of occupancy < 2,000 km².

Nomenclatural notes: — Baillon (1865) accepted *Cnemidostachys coriacea*

including *C. marginata* under *Stillingia coriacea*.

Morphological notes: — *Microstachys marginata* has upwards and coriaceous leaves with thickened margin as in *M. uleana*, but has appendages in the fruits whereas *M. uleana* does not. Its bracts have no glands and the apex of the sepals is deeply retuse.

Additional specimens examined: — **BRAZIL.** *Pohl* 1694 (K); **Bahia** 19 February 1987, *Harley, R.M.* 24384 *et al.* (K, SP, SPF); **Bahia: Abaíra**, 13°19' S, 41°51' W, 22 May 1992, *Ganev, W.* 342 (HUEFS, K, SP, SPF); **Bahia: Lençóis**, 12°27'52" S, 41°24'31" W, 22 November 2012, *Cordeiro, I.* 3395 *et al.* (HUEFS, SP); **Bahia: Palmeiras**, 12°27'04" S, 41°28'41" W, 25 August 2014, *Silva, O.L.M.* 176 *et al.* (SP); **Bahia: Piatã**, 13°03'46" S, 41°49'58" W, 2 November 1996, *Bautista, H.P.* PCD 3952 *et al.* (ALCB, K, SP); **Bahia: Rio de Contas**, 13°52' S, 42°19' W, 25 August 1993, *Ganev, W.* 2109 (K); **Minas Gerais** 12 April 1981, *Furlan, A.* CFCR 688 *et al.* (SP, SPF); **Minas Gerais: Cristália**, 16°43'59" S, 42°55'17" W, 24 June 2012, *Pscheidt, A.C.* 177 *et al.* (SP); **Minas Gerais: Diamantina**, 28 March 1892, *Glaziou, A.* 19838 (P); **Minas Gerais: Grão Mogol**, 6 September 1986, *Cordeiro, I.* CFCR 10152 *et al.* (SP, SPF); **Minas Gerais: Itacambira**, 16°36'58" S, 43°05'08" W, 26 June 2012, *Pscheidt, A.C.* 181 *et al.* (SP); **Minas Gerais: Joaquim Felício**, 6 March 1970, *Irwin, H.S.* 27008 (K); **Minas Gerais: Montes Claros**, 24 February 1969, *Irwin, H.S.* 23847 (K); **Minas Gerais: São Gonçalo do Rio Preto**, 18°07'20" S, 43°20'36" W, 19 February 2002, *Lombardi, J.A.* 4544 (BHCB, SP); **Minas Gerais: Francisco Sá**, 10 February 1969, *Irwin, H.S.* 22964 (K).

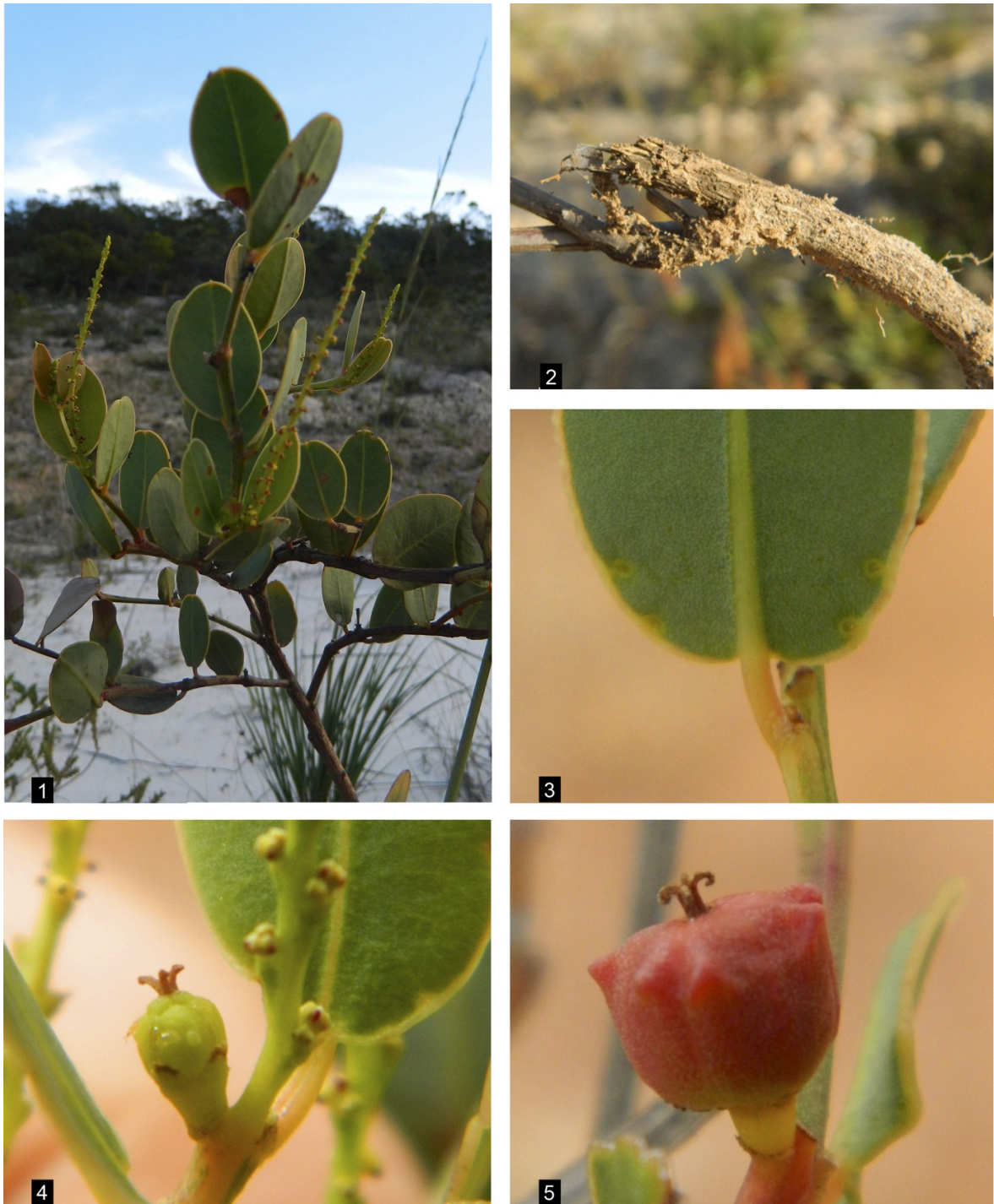


Figure 22. Images of *Microstachys marginata*. 1. Detail of branch. 2. Root system. 3. Leaf with glands and margin in detail. 4. Staminate and pistillate flowers. 5. Fruit. (A.C. Pscheidt).

***Microstachys nana* Silva & Esser (2011: 20)**

(Fig. 11 K-S, 23)

– Type specimen: BRAZIL. Parana, Porto Amazonas, Caiacanga, 13 October 1963, *G. Hatschbach* 10280 (holo: B!; iso: MBM!, UEC!).

Subshrub 10-30 cm tall, with developed root system, decumbent. Branches strigose, hairs 0.2-0.5 mm long. **Leaves** concolor; petiole 0.5-1 mm long, glabrous; blade ovate to obovate, often elliptic, 2-3 × 0.6-1 cm, chartaceous, sparsely strigose at midrib, hairs 0.2 mm long, brochidodromous, 2-4 pairs of marginal patelliform glands, 0.1 mm in diameter, base cuneate to obtuse, margin serrulate, plane, denticles inclined, 0.2 mm long, apex acute to obtuse; stipules ovate, 0.5-1 × 0.3-0.5 mm, strigose. **Inflorescence** 2.5-7 cm long, axis pubescent, hairs 0.5 mm long; bracts 0.6-1 × 0.2 mm, stipitate glands 0.2 mm in diameter, apex acuminate-cuspidate, margin slightly lacerate, pistillate cymule 1. **Staminate flower** 2, pedicellate, pedicel 0.4 mm long; sepals 0.5-0.7 × 0.4-0.5 mm, apex obtuse to rounded; stamens 0.4 mm long, anthers 0.2 mm long. **Pistillate flower** pedicellate, pedicel 1-1.5 mm long; sepals 1 × 0.5 mm, glandular, apex acute; ovary 1 × 1 mm, ornate, glabrous; stigmas 2 mm long, connate at base. **Fruit** globose, 5 × 5 mm, glabrous, pedicellate, pedicel 4 mm long; sepals non-persistent, stigmas persistent; numerous auriculate appendages on each mericarp, ca. 0.4 mm long; columella 5 mm long. **Seed** oblong, 2.5-3 × 2-2.5 mm, testa non-spotted.

Distribution: — *Microstachys nana* is endemic to the State of Parana, in southern Brazil, at elevations of 850–1,000 m, in the Araucaria Forest phytogeographic province (Fig. 14, Table 1).

IUCN conservation assessment: — Critically Endangered (CR), the species is known from a very small and unprotected area in the State of Parana.

Morphological notes: — *Microstachys nana* can be recognized by its well-developed underground system, leaves with thickened margins, with distinct basal dark glands in the blade, conspicuously pedicellate pistillate flowers, whole fruit recovered by appendages and stigmas up to 2,5mm long.

Additional specimens examined: — BRAZIL. **Paraná** 24 October 1908, *Dusén*, *P.* 6960 (K); **Paraná: Lapa**, 26 September 1948, *Hatschbach*, *G.* 1007 (SP); **Paraná: Porto Amazonas**, 25°32'47" S, 49°49'18" W, 19 October 2012, *Pscheidt*, *A.C.* 187 *et al.* (SP).



Figure 23. Images of *Microstachys nana*. 1. Habit. 2. Leaf with glands in detail. 3. Inflorescence. 4. Pistillate flower. 5. Fruit. (A.C. Pscheidt).

***Microstachys nummularifolia* (Cordeiro) Esser (1999: 959)**

(Fig. 15 G-L, 24)

≡ *Sebastiania nummularifolia* Cordeiro (1989: 77) – Type specimen: BRAZIL. Minas Gerais, Grão Mogol, 27 November 1984, *Harley et al. CFCR 6508* (holo: SPF!; iso: K!, SP!).

Shrubs 40-170 cm tall, with xylopodium, decumbent. Branches puberulous, hairs 0.2 mm long. **Leaves** concolor; petiole 0.5-1 mm long, puberulous, hairs 0.2 mm long; blade orbicular to broad-ovate, 0.1-0.5 × 0.1-0.4 cm, chartaceous, sparsely strigose at midrib, hairs 0.2 mm long, hyphodromous, 1-2 pairs of marginal crateriform glands, often in marginal lobes, base rounded, margin serrulate, revolute, denticles adpressed, 0.2 mm long, apex obtuse; stipules ovate, 0.5 × 0.3 mm, puberulous. **Inflorescence** 5-8 cm long, axis puberulous, hairs 0.5 mm long; bracts 0.5-0.8 × 0.5-0.8 mm, stipitate glands 0.2 mm in diameter, apex acute, margin lacerate, pistillate cymule 1. **Staminate flower** 1, pedicellate, pedicel 0.3 mm long; sepals 0.5 × 1 mm, apex obtuse-retuse; stamens 0.5 mm long, anthers 0.2 mm long. **Pistillate flower** pedicellate, pedicel 0.3 mm long; sepals 0.5 × 1 mm, glandular, apex obtuse-retuse; ovary 1 × 1 mm, ornate, puberulous; stigmas 1 mm long, connate at base. **Fruit** globose, 3-6 × 3-6 mm, puberulous, pedicellate, pedicel 0.5 mm long; sepals persistent, stigmas persistent; numerous horn-shaped appendagens on each mericarp, 0.4 mm long; columella 5-6 mm long. **Seed** globose, 2.5-3 × 2.5-3 mm, testa non-spotted.

Distribution: — *Microstachys nummularifolia* is endemic to the State of Minas Gerais in Brazil, from the Municipalities of Grão Mogol and Itambira, in Serra do Espinhaço range, in campo rupestre vegetation, at elevations of ca. 1,500 m, in Cerrado phytogeographic province (Fig. 3, Table 1).

IUCN conservation assessment: — Endangered (EN): the taxon is facing risk of extinction due its small populations in Minas Gerais (Brazil).

Morphological notes: — *Microstachys nummularifolia* has congest, orbicular and very small leaves, with less than 0.5 cm in diameter.

Additional specimens examined: — **BRAZIL.** 12 April 1981, *Furlan, A. CFCR 754 et al.* (SP, SPF); **Minas Gerais** November 1938, *Markgraf, F. 3379* (Z); **Minas Gerais: Botumirim**, 16°51'13" S, 43°01'58" W, 21 December 2004, *Mello-Silva, R. 2739 et al.* (RB, SP, SPF); **Minas Gerais: Grão Mogol**, 16°32' S, 42°54' W, 3 November 1987, *Cordeiro, I. CFCR 11409 et al.* (SP, SPF); **Minas Gerais: Itacambira**, 17°02'26" S, 43°20'46" W, 29 October 2009, *Hattori, E.K.O. 969 et al.* (BHCB).



Figure 24. Images of *Microstachys nummularifolia*. 1. Habit. 2. Root system. 3. Leaf with glands in detail. 4. Inflorescence. 5. Fruit. (A.C. Pscheidt).

***Microstachys revoluta* (Ule) Esser (1999: 959)**

(Fig. 15 M-S, 25)

≡ *Sebastiania revoluta* Ule (1909: 222) – Lectotype (designated by Esser 1998): BRAZIL. Bahia, Serra do Sincorá, without date, *Ule 7321* (HBG!; islecto: F-photo!).

Shrubs 20-100 cm tall, without xylopodium, erect. Branches costate, strigose, hairs 0.2 mm long. **Leaves** concolor; petiole 2-5 mm long, glabrous; blade ovate-cucullate, $0.4-0.6 \times 0.1$ cm, chartaceous, glabrous, hyphodromous, 1 pair of marginal glands, 0.1 mm in diameter, base obtuse, margin entire, revolute, apex acute-mucronate; stipules ovate, 0.3×0.1 mm, glabrous. **Inflorescence** 0.5-2 cm long, spirally axis glabrous; bracts 0.5×0.8 mm, sessile glands 0.2 mm in diameter, apex acute, margin serrulate, pistillate cymule 1. **Staminate flower** 1, pedicellate, pedicel 0.1 mm long, glabrous; sepals 0.5×0.2 mm, apex rounded-mucronate; stamens 0.2 mm long, anthers 0.2 mm long. **Pistillate flower** subsessile, pedicel 0.1 mm long; sepals 0.5×0.6 mm, eglandular, apex rounded-mucronate; ovary $0.5-0.6 \times 0.5-0.6$ mm, ornate, glabrous; stigmas 0.5 mm long, connate. **Fruit** globose, $2.5-3 \times 2.5-3$ mm, glabrous, pedicellate, pedicel 1 mm long; sepals persistent, stigmas persistent; numerous pyramidal appendages on each mericarp, 0.5 mm long; columella ca 2.5 mm long. **Seed** not seen.

Distribution: — *Microstachys revoluta* is endemic to Brazil in the State of Bahia in campo rupestre, near the city of Mucugê, at the base of the hills of Sierra Sincorá, at elevations of 800–900 m, in Caatinga phytogeographic province (Fig. 20, Table 1).

IUCN conservation assessment: — Critically Endangered (CR). This species shows very restricted distribution and occurs in a small area with risk of anthropic pressure.

Morphological notes: — *Microstachys revoluta* is similar to *M. ditassoides*, but has cucullate and revolute leaves with obtuse base, cylindric and spiraled inflorescences and glabrous fruits whereas the latter has plane leaves with hastate to sagittate base, distichous and compressed inflorescences and pubescent fruits.

Additional specimens examined: — BRAZIL. Bahia: 12°58' S, 41°28' W, 26 March 1980, Harley, R.M. 20987 *et al.* (K); Bahia: Mucugê, 13°04'58" S, 41°22'35" W, 21 November 2012, Pscheidt, A.C. 193 *et al.* (HUEFS, SP).



Figure 25. Images of *Microstachys revoluta*. 1. Flowering branches. 2. Root system. 3. Inflorescence with staminate flowers in detail. 4. Pistillate flower. 5. Fruit. (A.C. Pscheidt).

***Microstachys salicifolia* (Martius & Zuccarini) M.J.Silva, Pscheidt & Cordeiro (in press)**

(Fig. 7 J-Q, 26)

- ≡ *Cnemidostachys salicifolia* Martius & Zuccarini (1824b: 70) ≡ *Sebastiania corniculata* fo. *salicifolia* (Mart. & Zucc.) Müller Argoviensis (1866: 1171) ≡ *Sebastiania corniculata* var. *salicifolia* (Mart. & Zucc.) Müller Argoviensis (1874: 556) ≡ *Sebastiania salicifolia* (Mart. & Zucc.) Pax, Pax & Hoffmann (1912: 103) – Type specimen: BRAZIL. Minas Gerais, 1835, *Martius s.n.* (holo: M!; iso: E!, M!).
- = *Cnemidostachys longifolia* Martius & Zuccarini (1824b: 71) ≡ *Sebastiania corniculata* fo. *longifolia* (Mart. & Zucc.) Müller Argoviensis (1866: 1171) ≡ *Sebastiania corniculata* var. *longifolia* (Mart. & Zucc.) Müller Argoviensis (1874: 556) ≡ *Sebastiania salicifolia* var. *longifolia* (Mart. & Zucc.) Pax, Pax & Hoffmann (1912: 104) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. “Inter Minas Novas et flumen S. Francisci”, 1864, *Martius s.n.* (M!; isolecto: MO!).
- = *Sebastiania corniculata* var. *fischeri* Müller Argoviensis (1866: 1169) ≡ *Sebastiania salicifolia* var. *fischeri* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 104) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Without gazetteer and date, *Pohl 1719* (W; isolecto: K!, KIEL!).
- = *Sebastiania corniculata* var. *klotzschiana* Müller Argoviensis (1866: 1169) ≡ *Sebastiania hispida* var. *klotzschiana* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 106) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Minas Gerais, 1838, *Claussen 749* (S!; isolecto: NY!).
- = *Sebastiania corniculata* var. *leptoclada* Müller Argoviensis (1874: 554) ≡ *Sebastiania salicifolia* var. *leptoclada* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 104) – Type specimen: BRAZIL. Rio de Janeiro, “prope Tijuca”, without date, *Riedel 1200* (holo: P!).
- = *Sebastiania corniculata* var. *lurida* Müller Argoviensis (1874: 554) ≡ *Sebastiania salicifolia* var. *lurida* (Müll.Arg.) Pax, Pax & Hoffmann (1912: 104) – Type specimen: BRAZIL. Rio de Janeiro, Cabo Frio, without date, *Riedel s.n.* (holo: M!, iso: P!).
- = *Sebastiania salicifolia* var. *glaziovii* Pax & Hoffmann (1912: 104) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. “Rio de Janeiro und Minas Gerais”, without date, *Glaziou 15406* (K!).
- = *Sebastiania salicifolia* var. *similis* Pax & Hoffmann (1912: 104) – Type specimen:

BRAZIL. Minas Gerais, without date, *Mendonça 253* (holo: B-destroyed).

= *Sebastiania linearifolia* Lanjouw (1940: 701) – Type specimen: SURINAME. Boven Sipaliwini, “kamp XI”, 6 December 1935, *H.E. Rombouts 331* (holo: U!; iso: K!).

= *Sebastiania linearifolia* fo. *pilosa* Lanjouw (1940: 703) – Type specimen: SURINAME. Boven Sipaliwini, “kamp IV”, 24 October 1935, *H.E. Rombouts 238A* (holo: U!).

Shrubs 20-150 cm tall, without xylopodium, erect. Branch glabrous to pubescent, hairs 0.2 mm long. **Leaves** concolor; petiole 1-5 mm long, glabrous to pubescent, hairs 0.2 mm long; blade lanceolate to linear-elliptic, $2-12 \times 0.5-2.5$ cm, chartaceous, glabrous to pubescent, hairs 0.2 mm long, brochidodromous, 1-4 pairs of marginal crateriform glands, 0.1 mm in diameter, base obtuse, margin serrulate, plane, denticles adpressed, 0.2 mm long, apex acute-falcate; stipules ovate, $0.5-0.8 \times 0.2-0.3$ mm, glabrous. **Inflorescence** 2.5-5 cm long, axis glabrous to sparsely pubescent, hairs 0.2 mm long; bracts 0.5×0.5 mm, sessile glands 0.2 mm in diameter, margin lacerate, pistillate cymule 1. **Staminate flower** 1, pedicellate, pedicel 0.2 mm long; sepals 0.4×0.4 mm, apex rounded; stamens 0.2 mm long, anthers 0.2 mm long. **Pistillate flower** subsessile, pedicel 0.1 mm long; sepals 0.5×0.3 mm, eglandular, apex rounded; ovary 0.5×0.5 mm, inconspicuously ornate, glabrous; stigmas 0.1 mm long, free. **Fruit** oblong, $4-5 \times 3-4$ mm, glabrous, pedicellate, pedicel ca. 0.5 mm long; sepals persistent, stigmas persistent; 2-4 horn-shaped appendages on each mericarp, 0.2 mm long; columella 4 mm long. **Seed** oblong, $3-4 \times 2$ mm, testa spotted.

Distribution: — *Microstachys salicifolia* occurs throughout the south American cerrado and campos rupestres of Argentina, Bolivia and Brazil at elevations of 200–1,200 m, in 13 phytogeographic provinces (Fig. 27, Table 1).

IUCN conservation assessment: — Least concern (LC) due to the widespread distribution of its populations.

Morphological notes: — For a long time, *Microstachys salicifolia* was recognized under *M. corniculata*. These species are very similar, but the branches of *M. salicifolia* are long, stiff and flexuous in the endings, whereas the branches of *M. corniculata* are shorter and decumbent. Some morphological variations of this species are similar to *M. bidentata*, but *M. salicifolia* is recognized by its linear-lanceolate leaves with a falcate apex and pistillate flowers with long and cylindrical stigmas, while *M. bidentata* has linear leaves without falcate apex and globose stigmas.

Additional specimens examined: — ARGENTINA. Corrientes: Paso de la Patria,

26 March 1977, *Eskuche*, U. 3930 (Z); **Corrientes: San Cosme**, 2 May 1976, *Schinini*, A. 13014 *et al.* (SI); **Misiones: San Ignacio**, 27°26'63" S, 55°55'17" W, 15 January 2007, *Paula-Souza*, J. 7308 *et al.* (ESA, SI).

BOLIVIA. Cochabamba: Campero, 20 March 2003, *Atahuachi*, M. 744 (K); **Santa Cruz: Nuflo de Chavez**, 16°38'15" S, 62°27'00" W, 18 March 1991, *Quevedo*, R. 469 (LPB, MO); **Santa Cruz: Velasco**, 13°38'22" S, 60°54'05" W, 28 March 1996, *Carrion*, A. 71 (LPB); **Santa Cruz: Florida**, 18°16'13" S, 63°56'27" W, 29 March 2004, *Wood*, J.R.I. 20373 (K).

BRAZIL. 1870, *Burchell* 617A (P); **Amapá: Macapá**, 16 March 1962, *Mattos*, J. 9985 *et al.* (SP); **Amapá: Porto Platon**, 20 September 1961, *Pires*, J.M. 51124 (K); **Amazonas** April 1874, *Traill*, J.W.H. s.n. (K); **Amazonas: Campo Amélia**, 3°02' S, 60°35' W, 20 April 1986, *Prance*, G.T. 29973 (K); **Amazonas: Canutama**, 8°39'27" S, 64°21'39" W, 24 April 2007, *Hopkins*, M.J.G. 1785 *et al.* (BHCB); **Amazonas: Humaitá**, 18 November 1977, *Brantjes*, N.B.M. 700307 (SP); **Amazonas: Itacoatiara**, 4 April 1967, *Prance*, G.T. 4754 (K); **Amazonas: Manaus**, 3°02' S, 60°35' W, 1 March 1986, *Nelson*, L.O.A. 1461 (K); **Bahia**, *Torrend*, C. 133 (SP); **Bahia: Abaíra**, 13°17' S, 41°53' W, 16 May 1992, *Ganev*, W. 301 (HUEFS, K, SP, SPF); **Bahia: Barreiras**, 2 March 1972, *Anderson*, W.R. 36448 (K); **Bahia: Cocos**, 14°42'44" S, 45°52'47" W, 16 May 2001, *Fonseca*, M.L. 2743 *et al.* (IBGE, SP); **Bahia: Correntina**, 27 September 1978, *Coradin*, L. 1164 *et al.* (CEN, SP); **Bahia: Maraú**, 14°08' S, 38°59' W, 14 May 1980, *Harley*, R.M. 22050 (K); **Bahia: Palmeiras**, 12°25'43" S, 41°29'30" W, 29 June 1995, *Guedes*, M.L. PCD 2022 *et al.* (ALCB, K, SP); **Bahia: Piatã**, 13°16'01" S, 41°44'20" W, 9 November 1996, *Bautista*, H.P. PCD 4169 *et al.* (ALCB, SP); **Bahia: Rio de Contas**, 27 December 1997, *Carvalho*, A.M.V. 6329 (M); **Bahia: Santa Cruz de Cabralia**, 25 August 1994, *Guedes*, M.L. 3486 (SP); **Bahia: Seabra**, 24 February 1971, *Irwin*, H.S. 30876 (K); **Bahia: Vitória da Conquista**, 16 October 1981, *Hatschbach*, G. 44279 (MBM); **Ceará: Araripe**, January 1839, *Gardner* 1998 (BM); **Espirito Santo: Linhares**, 24 July 1985, *Folli*, D.A. 549 (K); **Goiás** 13 December 1951, *Amorim*, A.M. 3433 (SP); **Goiás: Alexânia**, 15 April 1980, *Allem*, A. 2640 *et al.* (CEN, SP); **Goiás: Alto Paraíso de Goiás**, 6 February 1987, *Pirani*, J.R. 1660 *et al.* (K, SP, SPF); **Goiás: Cavalcante**, 13°31'36" S, 48°03'45" W, 25 January 2001, *Pereira-Silva*, G. 4647 *et al.* (CEN, SP); **Goiás: Monte Alegre**, 11 March 1973, *Anderson*, W.R. 6828 (K); **Goiás: Niquelândia**, 26 November 1992, *Cordovil*, S.P. 203 *et al.* (CEN, SP); **Goiás: Pirenópolis**, 15°50'38" S, 48°55'02" W, 18 January 2005, *Paula-Souza*, J. 4089 *et al.* (ESA, SI); **Goiás: São Jorge**, 14°11'08" S, 47°51'10" W, 21 February 2012, *Pscheidt*, A.C. 125 *et al.* (SP); **Goiás: São João da Aliança**, 21 March 1973, *Anderson*, W.R. 7589 (K); **Goiás: Terezina**, 16 March 1973,

Anderson, W.R. 7271 (K); **Goiás: Veadeiros**, 13 March 1969, Irwin, H.S. 24285 (K); **Mato Grosso** 19°30' S, 56°10' W, 26 May 1989, Dubs, B. 971 (K); **Mato Grosso** 12°49' S, 51°46' W, 15 November 1967, Philcox, D. 3037 (P); **Mato Grosso: Bataguaçu**, 13 May 1970, Hatschbach, G. 24243 (MBM); **Mato Grosso: Biribiry**, 26 March 1892, Glaziou, A. 19839 (P); **Mato Grosso: Cuiabá**, 21 January 1989, Krapovickas, A. 43076 (K); **Mato Grosso: Cáceres**, 5 November 1978, Allem, A. 2419 *et al.* (CEN, SP); **Mato Grosso: Poconé**, 16 December 1976, Allem, A. 736 (CEN, SP); **Mato Grosso: Santa Cruz do Xingu**, 9°41'25" S, 52°36'33" W, 3 March 2011, Zappi, D.C. 3075 *et al.* (K, RB, SP, UNEMAT); **Mato Grosso: Serra do Roncador**, 27 May 1966, Irwin, H.S. 16093 *et al.* (NY, SP); **Mato Grosso: Xavantina**, 14°38' S, 52°14' W, 5 October 1967, Argent, G. 6658 (K); **Mato Grosso do Sul** 19°30' S, 56°10' W, 26 May 1989, Dubs, B. 971 (Z); **Minas Gerais** 12 April 1981, Furlan, A. CFCR 739 *et al.* (SP, SPF); **Minas Gerais: Berilo**, 13 February 2001, Neto, E.T. 3182 (BHCB, SP); **Minas Gerais: Biribiri**, 26 March 1892, Glaziou, A. 19839 (BM); **Minas Gerais: Conselheiro Mata**, 14 March 1990, Bacelar, M. 141 (PAMG); **Minas Gerais: Cristália**, 16°43'29" S, 42°55'40" W, 5 July 2007, Marino, F. 275 *et al.* (BHCB); **Minas Gerais: Diamantina**, 9 April 1973, Anderson, W.R. 8375 (K); **Minas Gerais: Esperança**, December 1916, Porto, P.C. 426 (Z); **Minas Gerais: Gouveia**, 2 February 1972, Anderson, W.R. 35104 (K); **Minas Gerais: Grão Mogol**, 16°34'30" S, 42°53'29" W, 23 June 2012, Pscheidt, A.C. 171 *et al.* (SP); **Minas Gerais: Parque Nacional do Caparaó**, 1 April 1989, Krieger, P.L. FPNC 890 (CESJ, SP); **Minas Gerais: Pirapora**, 11 January 1989, Krapovickas, A. 42887 *et al.* (CTES); **Minas Gerais: Santa Bárbara do Mato Dentro**, 12 January 1921, Hoehne, F.C. s.n. (SP); **Minas Gerais: São Gonçalo do Rio Preto**, 18°08'42" S, 43°22'16" W, 18 November 1999, Lombardi, J.A. 3539 (BHCB); **Minas Gerais: São João da Chapada**, 22 March 1970, Irwin, H.S. 28094 (K); **Minas Gerais: Unai**, 16°12'56" S, 47°19'32" W, 25 March 2002, Pereira-Silva, G. 6173 *et al.* (CEN, SP); **Pará** 23 April 1903, Ducke, A. 3517 (BM); **Pará: Altamira**, December 2005, Sobral, M. 10779 *et al.* (BHCB, SP); **Pará: Belem**, 14 October 1942, Archer, W.A. 7662 (K); **Pará: Belterra**, 17 July 1947, Black, G. 47-1056 (U); **Pará: Gorotire**, 7°47' S, 51°70' W, 19 January 1983, Gottsberger, G. 31-19183 (U); **Pará: Monte Alegre**, 19 March 1973, Oliveira, E. 6074 (P); **Pará: Santarem**, 1850, Spruce, R. s.n. (BM); **Piauí: Gilbués**, 6 February 1996, Rodrigues, S.M. 831 (SP); **Rio de Janeiro** March 1873, Glaziou, A. 6127 (K); **São Paulo: Itirapina**, 3 February 1993, Barros, F. 2551 (SP); **Tocantins: Conceição do Tocantins**, 11 May 2000, Hatschbach, G. 70901 *et al.* (MBM); **Tocantins: Guaraí**, 8°35'24" S, 48°10'48" W, 25 March 2010, Fonseca, M.L. 6440 *et al.* (IBGE, SP); **Tocantins: Ilha do Bananal**, 9°59'59" S, 50°07'12" W, 27 March 1999, Mendonça, R.C. 4062 *et al.* (IBGE, SP); **Tocantins: Palmas**, 10 January 2006,

Sobral, M. 10316 *et al.* (BHCB); **Tocantins: Taguatinga**, 13°21'13" S, 46°20'49" W, 26 January 2005, *Paula-Souza, J.* 4733 *et al.* (ESA, SI).

COLOMBIA. Rincon Hando 1 August 1924, *Allen, G.* 205 (K); **Villavicencio** 17 March 1939, *Alston, A.H.G.* 7564 (BM).

GUYANA. Rupununi 2°01' N, 59°34'00" W, 7 September 1997, *Jansen-Jacobs, M.J.* 5403 (U).

PARAGUAY. November 1909, *Fiebrig, K.* 4264 (BM); **Caaguazú** 25°00' S, 55°55' W, 13 December 1982, *Hahn, W.* 870 *et al.* (MO, SP); **Itapua: Yacyreta dam island reserve**, 27°15'00" S, 56°45'31" W, 7 December 2002, *Zardini, E.M.* 59489 *et al.* (M, SP); **Villarica** November 1875, *Balansa, B.* 1733 (BM).

SURINAME. 26 August 1966, *Donselaar, J.* 3597 (U); **Boven Sipaliwini** 6 December 1935, *Rombouts, H.E.* 331 (K); **Sipaliwini** 30 December 1968, *Oldenburger, F.H.F.* 721 (U).

VENEZUELA. Guarico: Calabozo, 16 October 1963, *McKee, H.S.* 10807 (K).

FRENCH GUIANA. 1859, *Sagot, T.* 1259 (K).



Figure 26. Images of *Microstachys salicifolia*. 1. Habit. 2. Inflorescence. 3. Pistillate and staminate flowers. 4. Fruit. 5. Columella. (A.C. Pscheidt).

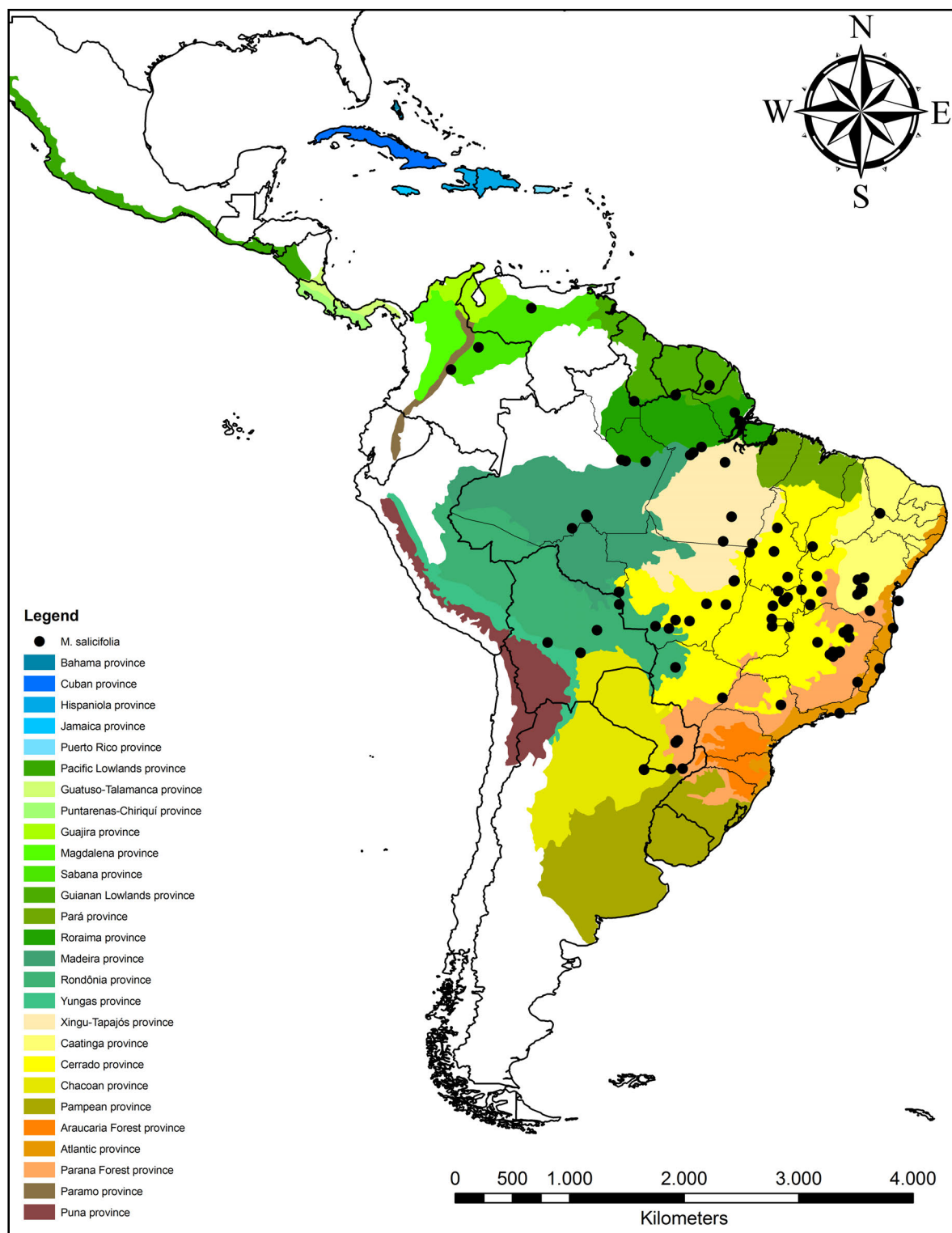


Figure 27. Distribution map of *Microstachys salicifolia*.

***Microstachys serrulata* (Martius & Zuccarini) Müller Argoviensis (1863: 90)**

(Fig. 18 O-R, 28)

- ≡ *Cnemidostachys serrulata* Martius & Zuccarini (1824a: 137, 1824b: 68) ≡ *Stillingia serrulata* (Mart. & Zucc.) Baillon (1865: 324) ≡ *Sebastiania serrulata* (Mart. & Zucc.) Müller Argoviensis (1866: 1167) – Lectotype (designated by Pscheidt *et al.* in press): Nov. Gen. Sp. Pl. 1: tab. XLII (1824).
- = *Microstachys serrulata* var. *glabrescens* Müller Argoviensis (1863: 90) ≡ *Sebastiania serrulata* var. *glabrescens* Müller Argoviensis (1866: 1167) – Type specimen: BRAZIL. Goias, without date, *Riedel s.n.* (holo: P! iso: K!).
- = *Microstachys serrulata* var. *oncocephalis* Müller Argoviensis (1863: 91) ≡ *Sebastiania serrulata* var. *oncocephalis* (Müll.Arg.) Müller Argoviensis (1866: 1167) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Without gazetteer, 1809, *Pohl s.n.* (M!).
- = *Sebastiania anisodonta* Müller Argoviensis (1874: 550) – Type: BRAZIL. Goias, Serra D'Ourada, without date, *Pohl 1555* (holo: M!; iso: W!).
- = *Sebastiania serrulata* var. *hispida* Müller Argoviensis (1874: 549) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Goias, Araracoara, without date, *Riedel 2200* (F!).
- = *Sebastiania serrulata* var. *oblongifolia* Müller Argoviensis (1974: 550) – Lectotype (designated by Pscheidt *et al.* in press): BRAZIL. Goias, without date, *Burchell 7014* (K!).
- = *Sebastiania serrulata* var. *fastigiata* Pax & Hoffmann (1912: 96) – Type specimen: PARAGUAY. Sierra de Amambay, December 1907, *Hassler 9856* (holo: BM!; iso: P!).

Subshrubs to shrubs 30-100 cm tall, with xylopodium, erect. Branches pubescent, hairs 0.3 mm long. **Leaves** concolor; petiole 1-5 mm long, pubescent, hairs 0.3 mm long; blade elliptic to ovate, 1.5-7 × 0.5-2 cm, chartaceous, pubescent, hairs 0.3 mm long, brochidodromous, 1-8 pairs of marginal crateriform glands, 0.2 mm in diameter, base obtuse, margin conspicuously serrate, plane, denticles inclined, 0.5 mm long, apex obtuse to acute; stipules ovate, 0.5-1 × 0.5-1 mm, pubescent. **Inflorescence** 1-3 cm long, axis pubescent, hairs 0.3 mm long; bracts 0.7 × 0.5 mm, sessile glands 0.1 mm in diameter, margin lacerate, pistillate cymule 1. **Staminate flower** 1-2, pedicellate, pedicel 0.2 mm long; sepals 0.5 × 0.3 mm, apex rounded; stamens 0.2 mm long, anthers 0.1 mm long. **Pistillate flower** pedicellate, pedicel 0.4 mm

long; sepals 1×1 mm, eglandular, apex rounded; ovary 1.5×1.5 mm, ornate, glabrous; stigmas 1 mm long, free. **Fruit** globose to oblong, $0.5\text{--}0.6 \times 0.4\text{--}0.5$ cm, glabrous, pedicellate, pedicel 1 mm long; sepals non-persistent, stigmas persistent; numerous horn-shaped appendages into two bands on each mericarp, ca. 1 mm long; columella 5 mm long. **Seed** oblong, $4\text{--}5 \times 2\text{--}2.5$ mm, testa spotted.

Distribution and habitat: — *Microstachys serrulata* occurs in Argentina, Bolivia, Paraguay and Brazil in Chacoan subregion in cerrado and campos rupestres, at elevations of 200–800 m, in five phytogeographic provinces. (Fig. 29, Table 1).

IUCN conservation assessment: — Least concern (LC) due to the widely distribution of its populations.

Nomenclatural notes: — Müller Argoviensis (1863) described *Microstachys serrulata* var. *oncoblepharis* and cited “Pohl 1699” as examined specimen, however this collection refers to the type of *Mabea pohliana* (Benth.) Müller Argoviensis (type: K!; iso: M!, F!, P!, W!). A lectotype is proposed here with a collection of Pohl from M herbarium.

Morphological notes: — Morphologically *Microstachys serrulata* can be recognized by its distinct serrate leaf margin with non-adpressed teeth and fruit with numerous appendages.

Additional specimens examined: — **ARGENTINA.** 19 March 1931, *Jorgensen, P.* 4673 (SI).

BOLIVIA. Chiquitos: Cerro Mutún, $19^{\circ}11'04''$ S, $57^{\circ}52'07''$ W, 17 October 1994, *Vargas, I.G.* 3282 (NY, USZ); **Santa Cruz** 18 October 1977, *Evrard, C.* 8191 (M); **Santa Cruz: Chiquitos,** $18^{\circ}32'25''$ S, $59^{\circ}57'15''$ W, 16 October 2008, *Wood, J.R.I.* 25142 *et al.* (UB); **Santa Cruz: Cordillera,** 30 December 1994, *Jardim, A.* 1578 (MO); **Santa Cruz: German Busch,** $19^{\circ}11'42''$ S, $57^{\circ}52'30''00'00''$ W, 10 March 2008, *Villarroel, D.* 1965 *et al.* (UB); **Santa Cruz: Ignacio Warnes,** $17^{\circ}36'$ S, $63^{\circ}08'$ W, 10 January 1998, *Beck, S.G.* 23481 (DAV, LPB, M, MG); **Santa Cruz: Nuflo de Chavez,** $16^{\circ}30'$ S, $62^{\circ}03'$ W, 1 April 2000, *Beck, S.G.* 25321 (M); **Santa Cruz: Santiago de Chiquitos,** $18^{\circ}20'$ S, $59^{\circ}35'$ W, 22 October 1994, *Vargas, I.G.* 3515 (NY); **Santa Cruz: Velasco,** $13^{\circ}53'41''$ S, $60^{\circ}48'46''$ W, 29 January 1997, *Soto, A.* 438 (MO, USZ).

BRAZIL. 20 November 2007, *Arantes, A.A.* SF497 *et al.* (SP); **Bahia: Jaborandi,** $13^{\circ}34'01''$ S, $44^{\circ}30'33''$ W, 19 April 2001, *Jardim, J.G.* 3689 *et al.* (CEPEC, SP); **Distrito Federal** 20 February 1988, *Ginzburg, S.* 706 *et al.* (SP); Distrito Federal 31 March 1985, *Silva, M.A.* 45 (IBGE, SP); **Distrito Federal: Brasília,** 6 October 1965, *Irwin, H.S.* 8982 *et al.* (NY, SP); **Distrito Federal: Brazlândia,** 13 December 1990, *Melo, E.* 416 *et al.* (SP);

Distrito Federal: Região Buracão, 15°34' S, 47°28' W, 12 March 1981, *Kirkbride Jr, J.H.* 4306 (SP); **Distrito Federal: Barragem Paranoá**, 14 December 1965, *Belem, R.P.* 1963 (K); Distrito Federal: **Goias** 18 January 1966, *Irwin, H.S.* 11713 *et al.* (NY, SP); **Goias: Catalão**, 24 January 1970, *Irwin, H.S.* 25276 (K); **Goias: Corumbá de Goias**, 16 January 1968, *Irwin, H.S.* 18651 (K); **Goias: Cristalina**, 8 March 1966, *Irwin, H.S.* 13797 (K); **Goias: Damianópolis**, 14°33'53" S, 46°07'23" W, 19 February 2003, *Mendonça, R.C.* 5289 *et al.* (IBGE, SP); **Goias: Goiania**, 18 December 1968, *Harley, R.M.* 11316 (K); **Goias: Goias Velho**, 18 January 1966, *Irwin, H.S.* 11713 (K); **Goias: Monte Alegre de Goias**, 11 March 1973, *Anderson, W.R.* 6777 (K); **Goias: Mossâmedes**, 16°40'45" S, 50°11'21" W, 29 November 2003, *Mello-Silva, R.* 2225 *et al.* (RB, SP, SPF); **Goias: Niquelandia**, 21 January 1972, *Irwin, H.S.* 34643 (K); **Goias: Posse**, 14°03'06" S, 46°19'01" W, 8 March 2001, *Fonseca, M.L.* 2494 *et al.* (IBGE, SP); **Goias: Quintas**, 16°00'50" S, 50°30'50" W, 29 November 2003, *Forzza, R.C.* 2503 *et al.* (RB, SP, SPF); **Goias: Serranópolis**, 18°25'48" S, 52°00'09" W, 19 August 1998, *Fonseca, M.L.* 1993 *et al.* (IBGE, SP); **Goias: São João da Aliança**, 23 March 1973, *Anderson, W.R.* 7811 (K); **Mato Grosso** 26 October 1968, *Harley, R.M.* 10847 (K); **Mato Grosso: Barra do Garças**, 6 December 1969, *Eiten, G.* 9753 *et al.* (SP); **Mato Grosso: Chapada dos Guimarães**, 13 August 1997, *Hatschbach, A.* 66847 *et al.* (MBM, SP); **Mato Grosso: Miranda**, 12 June 1973, *Silva, J.S.* 192 (SP); **Mato Grosso: Ponte Branca**, 16°38'59" S, 53°04'22" W, 30 December 2012, *Francener, A.* 1220 *et al.* (SP); **Mato Grosso: Rio Manso**, 13 August 1997, *Hatschbach, G.* 66877 (K); **Mato Grosso: Rio Verde**, 27 August 1973, *Hatschbach, G.* 32420 (MBM); **Mato Grosso: Rosário Oeste**, 14°39' S, 55°14' W, 9 October 1997, *Souza, V.C.* 20455 *et al.* (ESA, SP); **Mato Grosso: Serra do Roncador**, 3 June 1966, *Irwin, H.S.* 16537 *et al.* (NY, SP); **Mato Grosso: Tatuapé**, 8 November 1993, *Ratter, J.A.* 7033 (K); **Mato Grosso: Xavantina**, 3 June 1966, *Irwin, H.S.* 16537 (K); **Mato Grosso do Sul** 28 August 1986, *Conceição, C.A.* 1900 (SP); **Mato Grosso do Sul: Amambai**, 10 December 1982, *Hatschbach, G.* 45866 (K); **Mato Grosso do Sul: Naviraí**, 31 January 1998, *Ribas, O.S.* 2331 *et al.* (MBM, SP); **Mato Grosso do Sul: Três Lagoas**, 22°00' S, 49°00' W, 15 September 1964, *Gomes Jr, J.C.* 2103 (SP, UB); **Minas Gerais**, *Claussen, M.* 748 (P); **Minas Gerais: Conceição do Mato Dentro**, 23 November 1997, *Hatschbach, A.* 67440 *et al.* (MBM, SP); **Minas Gerais: Ibiá**, 19°34'51" S, 46°29'47" W, 2 March 1989, *Walter, B.M.T.* 18 (P); **Minas Gerais: Januária**, 21 April 1973, *Anderson, W.R.* 9289 (K); **Minas Gerais: Monte Carmelo**, 2 April 1992, *Hatschbach, G.* 56451 (K); **Minas Gerais: Paracatú**, 7 February 1970, *Irwin, H.S.* 26273 (K); **Minas Gerais: Paraopeba**, 12 April 2002, *Valente, G.E.* 950 (P); **Minas Gerais: Uberlândia**, 5 June 1992, *Araujo, G.M.* FEPP 206 *et al.* (HUFU, SP); **Paraná: São Jerônimo da Serra**, 2 April 2002,

Sá, K.L.V.R. 80 (FUEL, SP); **Rio Grande do Sul: Taquari**, 2 February 1992, *Sobral, M.* 7526 *et al.* (SP); **São Paulo** 20 January 1968, *Handro, O.* 2003 (K); **São Paulo: Agudos**, 11 September 2001, *Fabricante, J.R.* 8 (BAUR, SP); **São Paulo: Altinópolis**, 21°02'40" S, 47°37'40" W, 10 November 1994, *Tozzi, A.M.G.A.* 94 *et al.* (SP, UEC); **São Paulo: Andradina**, 18 February 2003, *Gomes, S.M.* 523 *et al.* (UEC); **São Paulo: Angatuba**, 23°21'29" S, 48°31'06" W, 27 January 1996, *Souza, V.C.* 10683 *et al.* (ESA, HRCB, SP, SPF, UBC); **São Paulo: Anhembi**, 2 May 1959, *Kuhlmann, M.* 4533 (SP); **São Paulo: Araraquara**, , *Lund* s.n. (P); **São Paulo: Assis**, 22°36'45" S, 50°23'93" W, 1 March 2013, *Pastore, M.* 261 (SP); **São Paulo: Assis**, 22°35'89" S, 50°22'15" W, 2 March 2013, *Pastore, M.* 264 (SP); **São Paulo: Botucatu**, 22°48'00" S, 48°17'05" W, 18 December 1985, *Bicudo, L.R.H.* 213 *et al.* (SP); **São Paulo: Brotas**, 24 February 1920, *Gehrt, G.* 27712 (SP); **São Paulo: Casa Branca**, 7 November 1994, *Kinoshita, L.S.* 94 *et al.* (ESA, HRCB, SP, SPF, SPSF); **São Paulo: Cerqueira César**, 18 December 1995, *Souza, V.C.* 9510 *et al.* (ESA, SP); **São Paulo: Descalvado**, 2 January 1966, *Bordo, A.* 45 (SP); **São Paulo: Entre São Carlos e Descalvado**, 3 February 1966, *Siqueira, O.P.* 15 (SP); **São Paulo: Itapetininga**, 17 March 1960, s.n. (SP); **São Paulo: Itirapina**, 22°15'05" S, 47°53'05" W, 30 November 1961, *Eiten, G.* 3416 *et al.* (SP); **São Paulo: Luis Antônio**, 12 March 1991, *Cordeiro, I.* 849 *et al.* (SP); **São Paulo: Mogi-Guaçu**, 22°14'56" S, 47°09'10" W, 25 January 2012, *Rodrigues, R.S.* 286 *et al.* (SP); **São Paulo: Paraguaçu Paulista**, 22°26' S, 50°36' W, 8 February 1965, *Eiten, G.* 5939 *et al.* (K, SP); **São Paulo: Paraguaçu Paulista**, 22°22' S, 50°35' W, 10 February 1965, *Eiten, G.* 6022 *et al.* (K, SP); **São Paulo: Pedregulho**, 20°11'50" S, 47°25'10" W, 16 February 2004, *Caruzo, M.B.R.* 45 *et al.* (SP); **São Paulo: Pirassununga**, 22°02' S, 47°30' W, 4 May 1994, *Batalha, M.A.* 95 *et al.* (SP); **São Paulo: Platina**, 19 December 1995, *Souza, V.C.* 9665 *et al.* (ESA, SP); **São Paulo: Rancharia**, 22°22'56" S, 51°05'41" W, 14 February 1996, *Souza, V.C.* 10960 *et al.* (ESA, SP); **São Paulo: Rincão**, 25 January 1928, *Toledo, J.F.* s.n. (SP); **São Paulo: Santa Fé do Sul**, 21 January 1997, *Amaral Júnior, A.* 41 *et al.* (BOTU, SP); **São Paulo: Santa Rita do Passa Quatro**, 21°36' S, 47°34' W, 8 January 1996, *Batalha, M.A.* 989 (SP); **São Paulo: São Simão**, 22 May 1957, *Kuhlmann, M.* 4116 (SP); **São Paulo: Águas de Santa Bárbara**, 19 December 1995, *Souza, V.C.* 9580 *et al.* (ESA, SP).

PARAGUAY. Amambay 10 December 1978, *Bernardi, L.* 19064 (BM); **Amambay: Parque Nacional Cerro Cora**, 22°40' S, 56°05' W, 1 November 1983, *Hahn, W.* 1709 (MO, SP); **Amambay: Pedro Juan Caballero**, 55°46' S, 22°33' W, 18 November 1963, *Gomes Jr, J.C.* 1446 (SP, UB); **Pinas bei Tarija** 12 March 1904, *Fiebrig, K.* 3139 (B); **San Pedro** 1 March 1994, *Krapovickas, A.* 45139 *et al.* (CTES); **San Pedro** 235032°00' S, 562339°00' W, 29 October 1996, *Zardini, E.M.* 45545 (M).



Figure 28. Images of *Microstachys serrulata*. 1. Flowering branch. 2. Staminate flowers with leaf margin in detail. 3. Pistillate flower. 4. Fruit. 5. Columella. (*M. Pastore*).

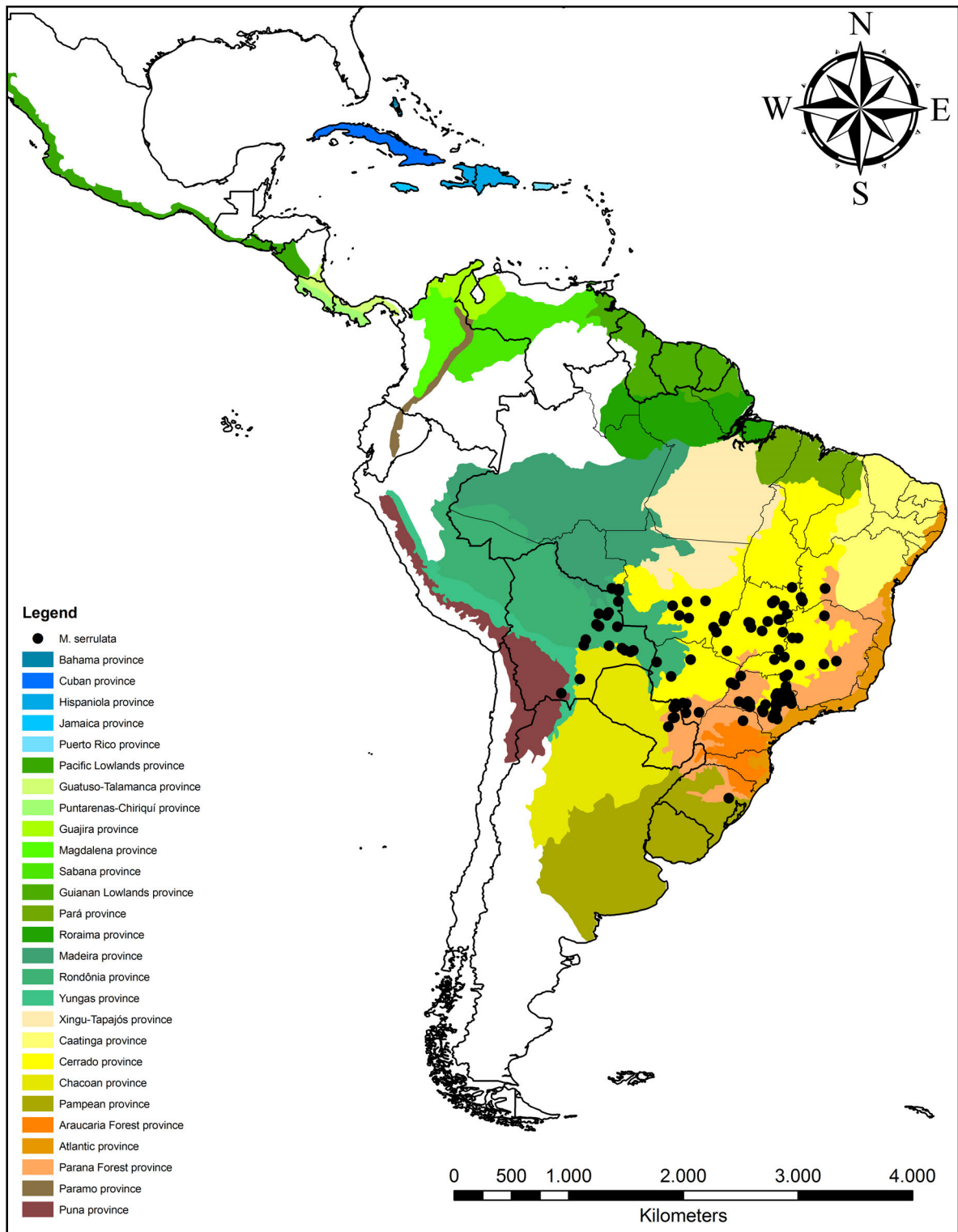


Figure 29. Distribution map of *Microstachys serrulata*.

***Microstachys stipulacea* (Müller Argoviensis) Esser & M.J.Silva, Silva & Esser (2011:24)**

(Fig. 4 J-O)

≡ *Gymnanthes stipulacea* Müller Argoviensis (1863: 96) ≡ *Cnemidostachys stipulacea* Klotzsch ex Baill., Baillon (1858: 516), *nom. nud.* ≡ *Stillingia stipulacea* (Müll.Arg.) Baillon (1865: 325) ≡ *Sebastiania stipulacea* (Müll.Arg.) Müller Argoviensis (1866: 1176) – Lectotype (designated by Silva & Esser 2011): BRAZIL or URUGUAY. Without gazetteer and date, *Sellow 3456* (holo: B-destroyed; iso: G, K!, P!).

Subshrub 12-30 cm tall, with xylopodium, erect. Branches glabrous. **Leaves** concolor; petiole 4-10 mm long, puberulous, hairs 0.1 mm long; blade obovate to orbicular, 0.8-2 × 0.5-1.5 cm, membranous, glabrous, brochidodromous, eglandular, base obtuse, margin crenulate-serrulate, plane to revolute, denticles adpressed, 0.5 mm long, apex rounded to obtuse; stipules linear-lanceolate, 2.5 × 0.3-0.4 mm, puberulous. **Inflorescence** 0.8-1 cm long, axis glabrous; bracts 0.5 × 0.5 mm, stipitate glands 0.2 mm in diameter, apex truncate-mucronate, margin lacerate, pistillate cymule 1. **Staminate flower** 1, pedicellate, pedicel 0.5 mm long; sepals 0.5 × 0.8 mm, apex rounded; stamens 0.2 mm long, anthers 0.3 mm long. **Pistillate flower** subsessile, pedicel 0.2 mm long; sepals 1.5 × 1.5 mm, eglandular, apex rounded-mucronate; ovary 1 × 1 mm, ornate, glabrous; stigmas 0.5 mm long, free. **Fruit** oblong, 3 × 3.5 mm, glabrous, pedicellate, pedicel 1 mm long; sepals persistent, stigmas non-persistent; numerous horn-shaped appendages into two bands on each mericarp, 0.5 mm long; columella 3 mm long. **Seed** globose, 1.5-2 × 1.5-2 mm, testa spotted.

Distribution and habitat: — *Microstachys stipulacea* is endemic to southern Brazil/Uruguay, in the Pampean phytogeographic province (Fig. 14, Table 1).

IUCN conservation assessment: — Data deficient (DD): there are few collections of *Microstachys stipulacea* available at herbaria and no recent records of this species were found in the field. This species appears to be very rare or possibly extinct in the wild, but we prefer not to categorize it due to the lack of information.

Morphological notes: — *Microstachys stipulacea* has distinct stipitate glands at the bracts, unique in the genus, long stipules and petiolate orbicular leaves. *M. nummularifolia* shows orbicular leaves too, but sessile whereas in *M. stipulacea* are long-petiolate.

Additional specimens examined: — BRAZIL. *Sellow* s.n. (K); Rio Grande do Sul 1883, *Gaudichaud*, C. 1697 (P).

URUGUAY. 1821, *St. Hilaire*, A. 2556 (P); 1821, *St. Hilaire*, A. 2996 (P).

***Microstachys uleana* (Pax & Hoffmann) Esser (1999: 959)**

(Fig. 4 P-U, 30)

≡ *Sebastiania uleana* Pax & Hoffmann (1912: 93) – Lectotype (designated by Esser 1999):

BRAZIL. Bahia, Serra da Vendinha, November 1906, *Ule* 7318 (HBG; islecto: F!, G!, K!, L!).

Shrubs 30-60 cm tall, with xylopodium, erect. Branches glabrous, densely branched. **Leaves** concolor; petiole 1-2 mm long, glabrous; blade ovate to elliptic, 1.5-3 × 0.8-1.5 cm, coriaceous, glabrous, brochidodromous, 2-4 pairs of marginal crateriform glands, 0.2 mm in diameter, base rounded, margin serrulate-repand, denticles adpressed, 0.1 mm long, apex obtuse-mucronate to obtuse-retuse; stipules obtuse, 0.3 × 0.5 mm, puberulous. **Inflorescence** 1-3 cm long, spirally axis glabrous; bracts 0.5 × 0.7 mm, sessile glands, margin slightly lacerate, pistillate cymule 1. **Staminate flower** 1, subsessile, pedicel 0.1 mm long, apex acute; stamens 0.2 mm long, anthers 0.2 mm long. **Pistillate flower** subsessile, pedicel 0.1 mm long; sepals 0.5 × 0.5, eglandular, apex acute; ovary 0.5 × 0.5 mm, inconspicuously ornate, glabrous; stigmas 1 mm long, connate at base. **Fruit** globose, 5 × 5 mm, glabrous, pedicellate, pedicel 0.5 mm long; sepals persistent, stigmas persistent; 1 pair of inconspicuous nodiform appendages on each mericarp, 0.1 mm long; columella 5 mm long. **Seed** oblong, 3.5 × 2 mm, testa spotted.

Distribution and habitat: — *Microstachys uleana* is endemic to the state of Bahia, occurring in campo rupestre at elevations of 1,000–1,200 m. The species is restricted to the Caatinga phytogeographic province (Fig. 20, Table 1).

IUCN conservation assessment: — Critically Endangered (CR). This species shows very restricted distribution and occurs in a small area with risk of anthropic pressure.

Morphological notes: — *Microstachys uleana* resembles *M. marginata*, but has a very branched stem, with a small xylopodium-like underground system, without appendages in the fruits or if present, they are very soft and inconspicuous while *M. marginata* is sparsely branched, has big xylopodium-like root underground system and fruits with conspicuous appendages.

Additional specimens examined: — BRAZIL. Bahia 27 February 2009, *Silveira, E.* s.n. (EAC); Bahia: Abaíra, 13°19' S, 41°51' W, 22 May 1992, *Ganev, W.* 342 (K); Bahia: Barra da Estiva, 31 January 1974, *Harley, R.M.* 15744 (K); Bahia: Morro do Chapéu, 17 February 1971, *Irwin, H.S.* 32420 (K); Bahia: Mucugê, 13°05'40" S, 41°22'43" W, 20

November 2012, *Pscheidt, A.C.* 192 *et al.* (HUEFS, SP); **Bahia: Palmeiras**, 12°27'04" S, 41°28'38" W, 22 November 2012, *Pscheidt, A.C.* 200 *et al.* (HUEFS, SP); **Bahia: Piatã**, 13°09' N, 41°47' W, 23 December 1991, *Harley, R.M.* H 50301 *et al.* (CEPEC, HUEFS, K, SP, SPF); **Bahia: Rio de Contas**, 16 November 1996, *Bautista, H.P.* PCD 4335 *et al.* (ALCB, K, SP); **Bahia: Seabra**, 24 February 1971, *Irwin, H.S.* 30968 (K).

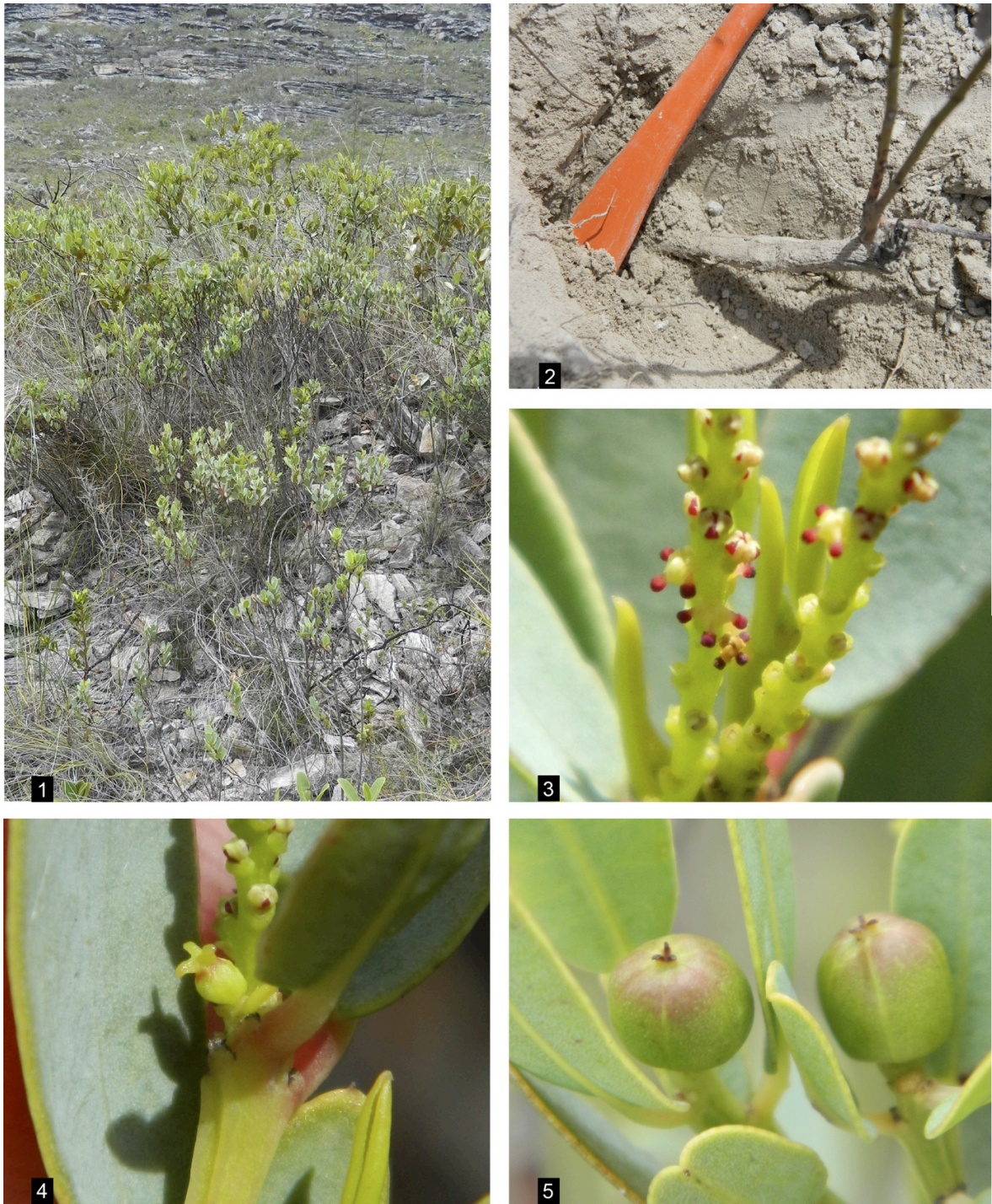


Figure 30. Images of *Microstachys uleana*. 1. Habit. 2. Root system. 3. Inflorescences with staminate flowers in detail. 4. Pistillate flower. 5. Fruits. (*A.C. Pscheidt*).

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Specimens Examined

Specimens are arranged by collector (with first initial, when known) in alphabetical order, followed by collector's number in increasing order (s. n. = without number), followed by species name in parentheses.

- A Adams, C.D. 13343, 13416, 13424 (*M. corniculata*); Allem, A. 735 (*M. corniculata*); 736 (*M. salicifolia*); 1081, 1123, 1124, 1126 (*M. ditassoides*); 2419, 2640 (*M. salicifolia*); Allen, G. 205, 413 (*M. salicifolia*); Almeida, C. 1948 (*M. glandulosa*); Alston, A.H.G. 5 (*M. corniculata*); 7564 (*M. salicifolia*); Amaral Júnior, A. 41 (*M. serrulata*); 100 (*M. corniculata*); 1740 (*M. glandulosa*); Amaral, A. 100 (*M. corniculata*); 1740 (*M. glandulosa*); Amorim, A.M. 756 (*M. corniculata*); 1047 (*M. glandulosa*); 2114, 2406 (*M. corniculata*); 2566 (*M. crotonoides*); 2960 (*M. heterodoxa*); 3433 (*M. salicifolia*); 6014 (*M. heterodoxa*); Andel, T. 1809 (*M. corniculata*); Anderson, W.R. 6605 (*M. corniculata*); 6777 (*M. serrulata*); 6828 (*M. salicifolia*); 6927 (*M. hispida*); 7271 (*M. salicifolia*); 7443 (*M. corniculata*); 7589 (*M. salicifolia*); 7665 (*M. bidentata*); 7680 (*M. crotonoides*); 7811 (*M. serrulata*); 8349 (*M. hispida*); 8358 (*M. crotonoides*); 8375 (*M. salicifolia*); 9289 (*M. serrulata*); 9848 (*M. bidentata*); 10013 (*M. glandulosa*); 10788 (*M. bidentata*); 11116 (*M. corniculata*); 35104 (*M. salicifolia*); 35592 (*M. bidentata*); 35624 (*M. salicifolia*); 36207 (*M. glandulosa*); 36448 (*M. salicifolia*); 36451 (*M. crotonoides*); 36519, 36609 (*M. bidentata*); Andrade, B.S. 17 (*M. revoluta*); Andrade, I.R. 438 (*M. glandulosa*); 450 (*M. corniculata*); Andrade, K. 25 (*M. glandulosa*); Anunciação, E.A. 226 (*M. glandulosa*); 665 (*M. corniculata*); Aona, L.Y.S. 97/20 (*M. crotonoides*); Aragaki, S. 1238 (*M. corniculata*); Arantes, A.A. SF497 (*M. serrulata*); Araujo, A. 6 (*M. corniculata*); Araujo, D. 55 (*M. crotonoides*); Araujo, G.M. FEEP206 (*M. serrulata*); Arbo, M.M. 3015 (*M. glandulosa*); 3115, 3421, 3632 (*M. bidentata*); 3825 (*M. corniculata*); 3843, 4100, 4159, 4310 (*M. glandulosa*); 4345 (*M. salicifolia*); 5565, 5806, 7402 (*M. corniculata*); Arbocz, G.F. 801 (*M. hispida*); 7151 (*M. bidentata*); Archer, W.A. 7662 (*M. salicifolia*); Argent, G. 6627 (*M. bidentata*); 6658 (*M. salicifolia*); Assis, M.A. 759 (*M. corniculata*); Atahuachi, M. 744 (*M. crotonoides*); Azevedo, M.L.M. 1318 (*M. bidentata*); Bacelar, M. 141 (*M. salicifolia*)

- B Baitello, J.B. 502 (*M. hispida*); Baker, C.F. 14 (*M. corniculata*); Balansa, B. 1733a (*M. crotonoides*); 1733c, 1733b (*M. hispida*); Barbosa, A.A.A. 181 (*M. ditassoides*); 213 (*M. bidentata*); 227 (*M. daphnoides*); 239 (*M. serrulata*);
- Barreto, M. 9621 (*M. salicifolia*); Barros, F. 2548 (*M. serrulata*); 2551 (*M. salicifolia*); 2650 (*M. bidentata*); 2796 (*M. glandulosa*); Bartlett, A.W. 8548 (*M. corniculata*); Batalha, M.A. 95 (*M. serrulata*); 96 (*M. bidentata*); 100 (*M. serrulata*); 287 (*M. bidentata*); 989 (*M. serrulata*); 2430, 3213 (*M. bidentata*); Bautista, H.P. PCD3609 (*M. corniculata*); PCD3952 (*M. marginata*); PCD4169 (*M. salicifolia*); PCD4335 (*M. uleana*); Beck, S.G. 1749 (*M. hispida*); 5661 (*M. bidentata*); 23481, 25321, 25367 (*M. serrulata*); Belem, R.P. 401 (*M. daphnoides*); 705 (*M. glandulosa*); 1963 (*M. serrulata*); 2111, 3545 (*M. heterodoxa*); Belgrano, M.J. 393 (*M. hispida*); Bene, P. P 4864592 (*M. corniculata*); Bernacci, L.C. 822 (*M. daphnoides*); Bernardi, L. 19064 (*M. serrulata*); Bianchetti, L.B. 621, 692 (*M. corniculata*); Bicudo, L.R.H. 213 (*M. serrulata*); Black, G. 47-1056 *pro parte* (*M. corniculata*); 47-1056 *pro parte* (*M. salicifolia*); Blanchet 742, 2025 (*M. corniculata*); 3658 (*M. heterodoxa*); 3756 (*M. corniculata*); Boerboom, L.B.B. 9173 (*M. corniculata*); Bommer, D.F.R. 35 (*M. hispida*); Bon, A. 15721 (*M. corniculata*); Bordo, A. 45 (*M. serrulata*); Bortolotto, I.M. 104 (*M. corniculata*); Brade 12761 (*M. glandulosa*); 13591 (*M. corniculata*); 13593 (*M. daphnoides*); 13596 (*M. bidentata*); Brandegee UC 110928 (*M. corniculata*); Brandão, M. 24429 (*M. glandulosa*); Brantjes, N.B.M. 700307 (*M. salicifolia*); 705208 (*M. glandulosa*); 706407, 706407 (*M. corniculata*); Brenning B 100467644 (*M. corniculata*); Broadway, W.E. 6732 (*M. corniculata*); Bruderreck, B. 29 (*M. hispida*); 223 (*M. serrulata*); Brügger, M.C. s.n (SP 443081) (*M. corniculata*); Burchell 6A00 (*M. serrulata*); 617A, 817A (*M. salicifolia*); 6097, 6220 (*M. ditassoides*); 6392 (*M. bidentata*); 6400 (*M. serrulata*); 6991 (*M. salicifolia*); 7538 (*M. ditassoides*); 7809 (*M. serrulata*); 8174 (*M. salicifolia*); 8527-6, 8527, 8642 (*M. corniculata*); 8898 (*M. salicifolia*); 9595 (*M. corniculata*); Burkart, A. 8099 (*M. hispida*); 17188 (*M. corniculata*); 30932 (*M. hispida*); Calderon, C.E. 2714 (*M. bidentata*).
- C Camargo, O. 62 (*M. hispida*); Campos, M.T.V.A. CFCR13290 (*M. bidentata*); CFCR13419 (*M. salicifolia*); Carmo, M.R.B. 722 (*M. hispida*); Carrion, A. 71 (*M. salicifolia*); Caruzo, M.B.R. 36 (*M. bidentata*); 45 (*M. serrulata*); Carvalho, A.M.V. 1623 (*M. corniculata*); 1663 (*M. heterodoxa*); 3145 (*M. corniculata*); 3689 (*M. bidentata*); 4200 (*M. corniculata*); 6329, 6349 (*M. salicifolia*); Castellani, M.R. 7 (*M. corniculata*); Castro, M.I.F. 43 (*M. corniculata*); Castro, N.M. 540 (*M. bidentata*); 541 (*M. glandulosa*); Catharino, E.L.M. 1846 (*M. glandulosa*); Cavalcanti, T.B. 1377

- (*M. bidentata*); CFCR8387 (*M. daphnoides*); CFCR8461 (*M. salicifolia*); Chiea, S.A.C. 37 (*M. serrulata*); Claussen, M. s.n. (P 4804677) (*M. ditassoides*); s.n. (P 4804581), 121 (*M. glandulosa*); 149 (*M. daphnoides*); 748 (*M. serrulata*); 750 (*M. ditassoides*); 751 (*M. bidentata*); 1562 (*M. glandulosa*); Claussen, P. P 4804581 (*M. glandulosa*); P 4804665 (*M. crotonoides*); 161, 162 (*M. glandulosa*); 470 (*M. crotonoides*); Cocchioni, P. 44082 (*M. glandulosa*); Colaris, W.J.J. 1040 (*M. corniculata*); Combs, R. P 4864607 (*M. corniculata*); Conceição, A.A. 1683 (*M. bidentata*); Conceição, C.A. s.n. (SP 328083) (*M. hispida*); 1848 (*M. crotonoides*); 1849 (*M. hispida*); 1900 (*M. serrulata*); 2503, 2655 (*M. hispida*); Coradin, L. 1164 (*M. salicifolia*); Cordeiro, I. CFCR9468 (*M. salicifolia*); 382 (*M. ditassoides*); 433 (*M. bidentata*); 849, 882, 883, 884 (*M. serrulata*); CFCR928 (*M. daphnoides*); 980 (*M. corniculata*); 1589 (*M. ditassoides*); 1992 (*M. corniculata*); 2769 (*M. daphnoides*); 3273 (*M. crotonoides*); 3351 (*M. corniculata*); 3352 (*M. salicifolia*); 3375 (*M. nana*); 3395 (*M. marginata*); CFSC8150 (*M. glandulosa*); CFCR10152 (*M. marginata*); CFSC10601 (*M. daphnoides*); CFCR11409 (*M. nummularifolia*); Cordovil, S.P. 203 (*M. salicifolia*); Coripe 443 (*M. corniculata*); Costa, G. 176 (*M. corniculata*); Costa, M.A.S. 141 (*M. corniculata*); Cremers, G. 78, 7995, 8714, 10609, 12878 (*M. corniculata*); Crespo, S. 3 (*M. glandulosa*); Cruz, J.S. 2511, 2517, 4219 (*M. corniculata*); Curran, H.M. 197 (*M. corniculata*); Curtiss, A.H. 266 (*M. corniculata*).
- D Damasceno, G.A. 2577 (*M. ditassoides*); Davidse, G. 10799 (*M. glandulosa*); 11607, 11879 (*M. corniculata*); 11920 (*M. heterodoxa*); 12038 (*M. corniculata*); 16123 (*M. bidentata*); 17952 (*M. crotonoides*); Degen, R. 1787 (*M. crotonoides*); 2228 (*M. hispida*); Delfini, C. 349 (*M. daphnoides*); Descoings, B. 20424 (*M. corniculata*); Donselaar, J. 35, 497, 3597 (*M. salicifolia*); 3640 (*M. corniculata*); Douglas 1133 (*M. corniculata*); Duarte, A. 2066 (*M. glandulosa*); Dubs, B. 971 (*M. salicifolia*); Ducke, A. 3517 (*M. salicifolia*); Dupré, M. P 4864472 (*M. bidentata*); D68 (*M. hispida*); Dusén, P. 6960 (*M. nana*)
- E Egea, J. 41 (*M. hispida*); Eiten, G. 1627 (*M. serrulata*); 3416 (*M. serrulata*); 3680, 3843, 4163, 4212 (*M. corniculata*); 5806 (*M. bidentata*); 5939, 6022 (*M. serrulata*); 6912 (*M. ditassoides*); 8437, 8483, 9448, 9622 (*M. bidentata*); 9753, 9969 (*M. serrulata*); 10821 (*M. bidentata*); Ek, R.C. 982 (*M. corniculata*); Ekman, E.L. H6572, 9801, 10457 (*M. corniculata*); Eskuche, U. 1269-37 (*M. corniculata*); 2783-46 (*M. hispida*); 3930 (*M. salicifolia*); 5295 (*M. corniculata*); Everaarts, A.P. 427, 724, 764, 991 (*M. corniculata*); Evrard, C. 8191 (*M. serrulata*).

- F Fabricante, J.R. 8 (*M. serrulata*); Faria, J.E.Q. 797 (*M. corniculata*); Faria, J.G. 173 (*M. ditassoides*); Farias, G.L. 556 (*M. daphnoides*); Farinaccio, M.A. 272 (*M. corniculata*); Fendler, A. 693, 2410 (*M. corniculata*); Fernandes, A. EAC 7572 (*M. glandulosa*); Ferreira P 4804608 (*M. crotonoides*); Ferreira Júnior, C.A. SP 471049, 824 (*M. crotonoides*); Ferreira, C.A.C. 5801 (*M. bidentata*); Ferreira, M.B. 9015 (*M. hispida*); Ferreira, M.C. PCD1827 (*M. heterodoxa*); Feuillet, C. 2333 (*M. corniculata*); Fiebrig, K. Z 81125 (*M. corniculata*); 3139A, 3139B (*M. hispida*); 4264 (*M. hispida*); 4375 (*M. dasycarpa*); 4386 (*M. dasycarpa*); Fiedler, L. 67 (*M. ditassoides*); Figueiredo, L. 73 (*M. glandulosa*); Figueiredo, M.S. 83-15 (*M. bidentata*); 83-18 (*M. glandulosa*); Filgueiras, T.S. 393 (*M. bidentata*); Filho, A.C. 227 (*M. bidentata*); 472 (*M. serrulata*); Folli, D.A. 549 (*M. salicifolia*); 3953, 4222 (*M. corniculata*); Fonseca, M.L. 569 (*M. ditassoides*); 834, 884 (*M. serrulata*); 977 (*M. ditassoides*); 1848 (*M. bidentata*); 1993 (*M. serrulata*); 2358 (*M. corniculata*); 2490 (*M. hispida*); 2494 (*M. serrulata*); 2501 (*M. bidentata*); 2743 (*M. salicifolia*); 3870 (*M. anisodonta*); 4153, 6139 (*M. bidentata*); 6440 (*M. salicifolia*); Fontellah, J.P. 220 (*M. glandulosa*); Forero, E. 7780 (*M. crotonoides*); 8295 (*M. bidentata*); 8630 (*M. corniculata*); Forzza, R.C. 2503 (*M. serrulata*); 3744 (*M. hispida*); 3815 (*M. glandulosa*); 3901 (*M. heterodoxa*); Foster, R.B. 14522 (*M. serrulata*); Francener, A. 1220 (*M. serrulata*); 1256 (*M. corniculata*); 1258 (*M. bidentata*); 1284 (*M. serrulata*); 1299, 1314 (*M. bidentata*); 1394 (*M. corniculata*); 1396 (*M. uleana*); 1398 (*M. crotonoides*); 1399 (*M. salicifolia*); França, F. 1202, 1208, 2166 (*M. corniculata*); 2648 (*M. heterodoxa*); 3638 (*M. glandulosa*); Froes, R. 11761 (*M. corniculata*); 20155 (*M. revoluta*); Fuentes, A. 581 (*M. corniculata*); 1455 (*M. serrulata*); 1773 (*M. ditassoides*); 2611, 5550 (*M. hispida*); Funch, R. 37 (*M. corniculata*); Furlan, A. CFCR688 (*M. marginata*); CFCR739 (*M. salicifolia*); CFCR754 (*M. nummularifolia*); 6468 (*M. glandulosa*); Félix, L.P. 7390 (*M. heterodoxa*).
- G Gaillard, M. P 4864534 (*M. corniculata*); Ganev, W. 76 (*M. corniculata*); 301 (*M. salicifolia*); 342 (*M. marginata*); 738 (*M. corniculata*); 1280, 1359 (*M. salicifolia*); 1505 (*M. glandulosa*); 1729 (*M. bidentata*); 2109 (*M. marginata*); 2369 (*M. corniculata*); 2376 (*M. hispida*); 2379 (*M. salicifolia*); 2637 (*M. crotonoides*); 3113 (*M. salicifolia*); 3139, 3202, 3369 (*M. uleana*); 3520 (*M. bidentata*); Gardner, G 284, 1998 (*M. salicifolia*); 5619, 6088 (*M. corniculata*); Garvizu, M. 105 (*M. corniculata*); Gates 170 (*M. bidentata*); 223 (*M. ditassoides*); Gaudichaud, C. 239 (*M. ditassoides*); 240 (*M. bidentata*); 249, 259 (*M. hispida*); 955 (*M. bidentata*); 1697

(*M. stipulacea*); Gehrt, G. s.n. SP 5301 (*M. bidentata*); 27712 (*M. serrulata*); Gemtchújnicov, I.D. SP 498, 14 (*M. corniculata*); Ginzburg, S. 706 (*M. serrulata*); Girgensen, P. 4327 (*M. corniculata*); Giulietti, A.M. PCD1595 (*M. heterodoxa*); 1625, 1626 (*M. salicifolia*); 2214 (*M. uleana*); PCD3244 (*M. heterodoxa*); CFCR3567 (*M. nummularifolia*); PCD6152 (*M. daphnoides*); Glaussen, M. 1563 (*M. crotonoides*); Glaziou, A. P 4804580 (*M. glandulosa*); P 4804607 (*M. corniculata*); 364 (*M. glandulosa*); 1314 (*M. corniculata*); 6127 (*M. salicifolia*); 8929 (*M. crotonoides*); 11535 (*M. corniculata*); 11541 (*M. salicifolia*); 15405 (*M. hispida*); 15406 (*M. salicifolia*); 15409 (*M. hispida*); 16340 (*M. salicifolia*); 17213 (*M. crotonoides*); 18454 (*M. glandulosa*); 19838 (*M. marginata*); 19839 (*M. salicifolia*); 19840 (*M. daphnoides*); 19841 (*M. bidentata*); 22096, 22097 (*M. ditassoides*); 22098 (*M. bidentata*); 22099a (*M. daphnoides*); Glaziou, M. 8929 (*M. crotonoides*); 11541 (*M. salicifolia*); Gleason, H.A. 22, 477 (*M. corniculata*); Glocker 49 (*M. corniculata*); Gomes Jr, J.C. 1446, 2103 (*M. serrulata*); Gomes, A.P.S. 309 (*M. hispida*); Gomes, J.C. 2291 (*M. serrulata*); Gomes, L.A. 262 (*M. corniculata*); Gomes, S.M. 523 (*M. serrulata*); González, V.M. 101, 102 (*M. serrulata*); 115 (*M. bidentata*); Gottsberger, G. 31-19183 (*M. corniculata*); 150991-1-5 (*M. ditassoides*); Granville, J.J. 6652, 13761 (*M. corniculata*); Grenand 977 (*M. corniculata*); Greuter, W. 25612 (*M. corniculata*); Grewal, M.S. 103 (*M. corniculata*); Grosourdy 13 (*M. corniculata*); Guedes, M.L. PCD386 (*M. uleana*); PCD732 (*M. corniculata*); PCD1925 (*M. uleana*); PCD2022 (*M. salicifolia*); PCD2059 (*M. corniculata*); 3486 (*M. salicifolia*); Guillén, R. 1082 (*M. serrulata*); 1384 (*M. bidentata*); Gutiérrez, E. 719 (*M. hispida*); 845 (*M. corniculata*); 1038, 1108 (*M. serrulata*); 1111 (*M. bidentata*); Guyon, N. 37 (*M. corniculata*).

- H Haase, R. 334, 521 (*M. bidentata*); Hahn, W. 870 (*M. salicifolia*); 1709 (*M. serrulata*); Handro, O. 2003 (*M. serrulata*); Harley, R.M. PCD4452 (*M. salicifolia*); CFCR4610 (*M. daphnoides*); CFCR6503 (*M. salicifolia*); 10847, 11316 (*M. serrulata*); 15032 (*M. crotonoides*); 15131 (*M. uleana*); 15311 (*M. salicifolia*); 15353 (*M. crotonoides*); 15744 (*M. uleana*); 15909 (*M. corniculata*); 16079 (*M. uleana*); 16653 (*M. daphnoides*); 17091 (*M. salicifolia*); 18425 (*M. corniculata*); 18470 (*M. heterodoxa*); 18590 (*M. glandulosa*); 18941 (*M. corniculata*); 19015 (*M. bidentata*); 19191 (*M. heterodoxa*); 19782, 20045 (*M. salicifolia*); 20078 (*M. daphnoides*); 20110 (*M. hispida*); 20544 (*M. crotonoides*); 20961 (*M. bidentata*); 20987 (*M. revoluta*); 21767 (*M. bidentata*); 21819 (*M. corniculata*); 22050 (*M. salicifolia*); 22106 (*M. heterodoxa*); 22257 (*M. glandulosa*); 22694

(*M. heterodoxa*); 22782 (*M. glandulosa*); 22981 (*M. corniculata*); 24134 (*M. marginata*); 24348 (*M. corniculata*); 24384 (*M. marginata*); 24948 (*M. corniculata*); 25018 (*M. marginata*); 25038 (*M. salicifolia*); 25047, 25135 (*M. nummularifolia*); 25585, 25671, 26099 (*M. salicifolia*); 26152 (*M. hispida*); 26186 (*M. marginata*); 26981 (*M. corniculata*); 27187 (*M. bidentata*); 27616 (*M. hispida*); 28460 (*M. glandulosa*); 50118 (*M. corniculata*); 50155, H50301 (*M. uleana*); 50405 (*M. daphnoides*); 50526 (*M. salicifolia*); 50689 (*M. marginata*); 54059 (*M. glandulosa*); 54497 (*M. revoluta*); 55959 (*M. salicifolia*); Harrison, S.G. 885, 1151 (*M. corniculata*); Hassler, E. 2363 (*M. crotonoides*); 2363, 2648, (*M. hispida*); 3477 (*M. crotonoides*); 3830, 4901, 4902, 6784 (*M. hispida*); 6907 (*M. corniculata*); 7724, 11491 (*M. hispida*); Hatschbach, A. 66847, 66877, 67440 (*M. serrulata*); Hatschbach, G. 1007 (*M. nana*); 6899 (*M. hispida*); 11302 (*M. corniculata*); 14233 (*M. crotonoides*); 16755, 24243 (*M. corniculata*); 24324 (*M. hispida*); 28010, 31691 (*M. salicifolia*); 32420 (*M. serrulata*); 33189 (*M. corniculata*); 34424 (*M. hispida*); 36479 (*M. salicifolia*); 36509 (*M. daphnoides*); 39911 (*M. hispida*); 41602 (*M. salicifolia*); 43693, 44279 (*M. corniculata*); 45866 (*M. serrulata*); 48013, 48218 (*M. corniculata*); 49734 (*M. marginata*); 56451 (*M. serrulata*); 60162 (*M. bidentata*); 60329 (*M. corniculata*); 66877 (*M. serrulata*); 67464 (*M. daphnoides*); 69426, 70901 (*M. corniculata*); 71031 (*M. bidentata*); 74847 (*M. hispida*); Hatschbach, G.; M 53854 (*M. bidentata*); 53973 (*M. corniculata*); 54260 (*M. salicifolia*); 54553 (*M. corniculata*); 56814 (*M. salicifolia*); Hattori, E.K.O. 969 (*M. nummularifolia*); 1018 (*M. salicifolia*); Hekking, W.H.A. 1063 (*M. corniculata*); Henkel, T.W. 624 (*M. corniculata*); Henri, Y. 166 (*M. crotonoides*); Hensold, N.C. CFCR3527 (*M. salicifolia*); Herbert, M. 359, 360 (*M. corniculata*); Heringer, E.P. 4287, 10638 (*M. hispida*); 14330 (*M. bidentata*); 16116, 17924, 18041 (*M. ditassoides*); Hind, D.J.N. PCD4055 (*M. daphnoides*); PCD4148 (*M. marginata*); H50468 (*M. daphnoides*); Hind, N. PCD3204 (*M. glandulosa*); Hoff, M. 5213 (*M. corniculata*); Hoehne, F.C. SP 2730, SP 36843 (*M. bidentata*); SP 4918 (*M. salicifolia*); 91, 1881 (*M. corniculata*); Hoehne, L.C. SP 1688 (*M. bidentata*); Hoehne, W. 5576, 5577 (*M. daphnoides*); 5579, 5637 (*M. glandulosa*); 5687 (*M. corniculata*); Hoffmann, J.R.R. 63, 2467, 3652 (*M. corniculata*); Holinberg 94 (*M. crotonoides*); Hopkins, M.J.G. 1785 (*M. salicifolia*); Hora, M.J. 24 (*M. glandulosa*); Huber 14 (*M. corniculata*); Huber, J. 514 (*M. corniculata*); Hunt, D.R. 5424 (*M. glandulosa*); 5584 (*M. bidentata*); 6676 (*M. hispida*).

- I Illiens 3672 (*M. corniculata*); Irenice, A. 365 (*M. crotonoides*); Irwin, H.S. 5399, 5731 (*M. corniculata*); 6227 (*M. ditassoides*); 6554 (*M. bidentata*); 6888 (*M. serrulata*);

8018, 8201 (*M. ditassoides*); 8211, 8349 (*M. corniculata*); 8980 (*M. corniculata*); 8982 (*M. serrulata*); 9099 (*M. ditassoides*); 9190 (*M. bidentata*); 9538 (*M. corniculata*); 10122 (*M. bidentata*); 10784 (*M. ditassoides*); 11351 (*M. bidentata*); 11713, 12213 (*M. serrulata*); 12338, 12716 (*M. bidentata*); 12846 (*M. anisodonta*); 13797 (*M. serrulata*); 14374, 14659 (*M. bidentata*); 15571 (*M. hispida*); 16040 (*M. bidentata*); 16091 (*M. bidentata*); 16093 (*M. salicifolia*); 16341, 16492 (*M. bidentata*); 16537 (*M. serrulata*); 16887 (*M. bidentata*); 18278 (*M. corniculata*); 18651 (*M. serrulata*); 19260, 19790 (*M. hispida*); 20304 (*M. bidentata*); 20467 (*M. glandulosa*); 20806a (*M. daphnoides*); 21658 (*M. corniculata*); 21838 (*M. salicifolia*); 21845 (*M. crotonoides*); 22265 (*M. bidentata*); 22271 (*M. daphnoides*); 22272 (*M. salicifolia*); 22602 (*M. corniculata*); 22762 (*M. salicifolia*); 22964 (*M. marginata*); 23375 (*M. nummularifolia*); 23404 (*M. crotonoides*); 23405, 23478 (*M. salicifolia*); 23627 (*M. marginata*); 23687 (*M. glandulosa*); 23847 (*M. marginata*); 23995, 24018, 24285 (*M. salicifolia*); 24630 (*M. corniculata*); 25271 (*M. bidentata*); 25276, 26273 (*M. serrulata*); 26578, 26582 (*M. hispida*); 26685 (*M. serrulata*); 27008 (*M. marginata*); 27410 (*M. daphnoides*); 27885 (*M. corniculata*); 28093 (*M. hispida*); 28094 (*M. salicifolia*); 28912 (*M. crotonoides*); 29198 (*M. hispida*); 29503, 30414 (*M. hispida*); 30415, 30767 (*M. glandulosa*); 30876 (*M. salicifolia*); 30968 (*M. uleana*); 30974 (*M. bidentata*); 30994 (*M. glandulosa*); 31365 (*M. hispida*); 31366 (*M. bidentata*); 32420 (*M. uleana*); 32868 (*M. salicifolia*); 33098 (*M. anisodonta*); 34113 (*M. glandulosa*); 34443 (*M. ditassoides*); 34643, 34810 (*M. serrulata*);

J Jansen-Jacobs, M.J. 4133, 4465, 5403 (*M. corniculata*); Janssen, A. 104 (*M. corniculata*); 367, 674 (*M. bidentata*); Jardim, A. 180, 555 (*M. serrulata*); 1495 (*M. hispida*); 1578, 3654 (*M. serrulata*); 3655 (*M. hispida*); Jardim, J.G. 739 (*M. heterodoxa*); 3648 (*M. daphnoides*); 3689 (*M. serrulata*); 5776 (*M. corniculata*); Jimenez, S. 1371 (*M. corniculata*); Jiménez, B. 39 (*M. corniculata*); Joly, A.B. 101, 977 (*M. glandulosa*); 989 (*M. ditassoides*); 1150, 1642, 2420, 2436, 2531 (*M. glandulosa*); 2539 (*M. daphnoides*); 3005 (*M. glandulosa*); 3521 (*M. ditassoides*); Jonker-VerhoeF, A.M.E. 10, 526 (*M. corniculata*); Jorgensen, P. 2855 (*M. corniculata*); 4673 (*M. serrulata*); Junqueira, M.E.R. 203 (*M. heterodoxa*).

K Kappler, A. 1886 (*M. corniculata*); Kee, M. 10587 (*M. corniculata*); Killeen, T.J. 3701, 5847, 7040A, 7303, 7338 (*M. hispida*); 8165 (*M. crotonoides*); Kinoshita, L.S. 94 (*M. serrulata*); Kinupp, V.F. 1094 (*M. crotonoides*); Kirizawa, M. 385, 405 (*M. serrulata*); 3036 (*M. daphnoides*); 3251 (*M. hispida*); Kirkbride Jr, J.H. 4306 (*M. serrulata*); 4436 (*M. ditassoides*); Klitgaard, B.B. 1184 (*M. bidentata*); Kral, R.

- 72727 (*M. salicifolia*); 72852 (*M. ditassoides*); 75871 (*M. bidentata*); Kramer, K.U. 2595, 10832 (*M. corniculata*); Krapovickas, A. 13763, 21680 (*M. crotonoides*); 23374, 23839 (*M. hispida*); 24209, 24460 (*M. crotonoides*); 32929 (*M. corniculata*); 42887, 43076 (*M. salicifolia*); 45139 (*M. serrulata*); 45496, 45794 (*M. hispida*); Krapovickas, C.L. 23196 (*M. glandulosa*); Krieger, L. SP 367447 (*M. daphnoides*); FPNC890 (*M. salicifolia*); 9665 pro parte (*M. daphnoides*); 9665 pro parte (*M. hispida*); 9684, 10380 (*M. glandulosa*); 13183 (*M. corniculata*); 14737 (*M. daphnoides*); Kuhlmann, M. 1578 (*M. serrulata*); 2971 (*M. corniculata*); 3526 (*M. bidentata*); 4116, 4117 (*M. serrulata*); 4186 (*M. bidentata*); 4533 (*M. serrulata*).
- L Laca-Buendia, J.F. 794 (*M. corniculata*); Lehmann, F.C. 4546 (*M. corniculata*); Leitão-Filho, H.F. 6574 (*M. serrulata*); 9290 (*M. bidentata*); 9515, 9576, 27530, 27569 (*M. hispida*); 33286, 34662 (*M. corniculata*); Lima, A. 53-1375 (*M. corniculata*); Lima, H.C. 948 (*M. marginata*); Lima, L.R. 211 (*M. hispida*); 381 (*M. corniculata*); 413 (*M. hispida*); Lindeman, J.C. 978, 5070 (*M. corniculata*); Liogier, A.H. 12318 (*M. corniculata*); Loefgren 1048 (*M. serrulata*); Lombardi, J.A. 3539, 3731 (*M. salicifolia*); 4544 (*M. marginata*); Longhi-Wagner, H. 3246, 3246 (*M. serrulata*); Lourteig, A. 2966 (*M. crotonoides*); 3163 (*M. hispida*); Lovo, J. 30 (*M. daphnoides*); Lowe, J. 3978 (*M. corniculata*); Lucena, M.F.A. 8 (*M. glandulosa*); Luchi, A.E. 432 (*M. corniculata*); Luetzelburg 31 (*M. corniculata*); 34 (*M. uleana*); 461, 26269, 26272 (*M. corniculata*); Lughadha, E.M. H50203 (*M. corniculata*); Lützelburg 1448 (*M. bidentata*).
- M Maas, P.J. 521, 546, 546, 3130 (*M. corniculata*); 3314 (*M. crotonoides*); 8717 (*M. hispida*); Macedo, A. 953 (*M. serrulata*); 3706 (*M. ditassoides*); Machado, O. 71320 (*M. glandulosa*); Magenta, M. 179, 255 (*M. corniculata*); Maguire, B. 22758, 24999 (*M. corniculata*); Makino-Watanabe, H. SP 146643 (*M. bidentata*); Mamani, F. 403, 654, 664 (*M. corniculata*); Mamede, M.C.H. CFCR3399 (*M. salicifolia*); Mantovani, W. 246 (*M. bidentata*); 247, 315, 642, 706, 805, 847, 883, 1063 (*M. serrulata*); 1103 (*M. bidentata*); 1168 (*M. serrulata*); 1307 (*M. bidentata*); 1325, 1378, 1451 (*M. serrulata*); 1481 (*M. bidentata*); 1492, 1568, 1572, 1693, 1818 (*M. serrulata*); Marcondes-Ferreira, W. 1301 (*M. daphnoides*); Marino, F. 275 (*M. salicifolia*); 317 (*M. marginata*); Markgraf, F. 3040 (*M. glandulosa*); 3347 (*M. marginata*); 3379 (*M. nummularifolia*); Marques, A.R. 26147 (*M. daphnoides*); Martius L 22614 (*M. salicifolia*); Herb. Fl. Bras. 427, Herb. Fl. Bras. 906 (*M. crotonoides*); 32, 666 (*M. corniculata*); 1389 (*M. glandulosa*); Marín, G. 276, 521 (*M. hispida*); Matos, M.N.F. 67 (*M. corniculata*); Mattos, J. 9632 (*M. bidentata*); 9985

- (*M. salicifolia*); 10763 (*M. corniculata*); 15294 (*M. hispida*); 30362 (*M. corniculata*); Mattos, J.R. 8170, 8466 (*M. serrulata*); McKee, H.S. 10807 (*M. crotonoides*); McVaugh, R. 21101 (*M. corniculata*); Meira Neto, J.A.A. 20006 (*M. bidentata*); Meireles, L.D. 2345 (*M. corniculata*); Mello-Barreto 4796 (*M. crotonoides*); Mello-Silva, R. 1456 (*M. crotonoides*); 1491 (*M. nummularifolia*); 1496, 1516 (*M. glandulosa*); 1638 (*M. corniculata*); 2013 (*M. hispida*); 2225 (*M. serrulata*); 2254 (*M. bidentata*); 2739, CFCR9599 (*M. nummularifolia*); Melo, E. 403 (*M. ditassoides*); 416 (*M. serrulata*); 898 (*M. corniculata*); PCD1367 (*M. heterodoxa*); PCD1378 (*M. corniculata*); Mendonça, R.C. 165, 1373 (*M. bidentata*); 2657 (*M. ditassoides*); 3855 (*M. bidentata*); 4062, 4592 (*M. salicifolia*); 5220 (*M. glandulosa*); 5227 (*M. bidentata*); 5289 (*M. serrulata*); Mendoza, M. 221 (*M. serrulata*); Mexia, Y. 4191 pro parte (*M. corniculata*); 4191 pro parte (*M. hispida*); 5724B (*M. daphnoides*); 5724A (*M. glandulosa*); 5724 (*M. hispida*); 5829 pro parte (*M. crotonoides*); 5829 pro parte (*M. hispida*); Miers, J. 912 (*M. corniculata*); Miranda, A.M. 4482 (*M. corniculata*); Miranda, E.B. 724 (*M. bidentata*); Miranda-Silva, E. 181 (*M. corniculata*); Moore, S. 580 (*M. serrulata*); Moraes, A. 4 (*M. corniculata*); Moraes, M. 1627 (*M. hispida*); Mori, S. 13345 (*M. heterodoxa*); 13398 (*M. corniculata*); Mori, S.A. 9447 (*M. corniculata*); 11953 (*M. heterodoxa*); 12556 (*M. corniculata*); 12971 (*M. heterodoxa*); 13187 (*M. corniculata*); 14276, 14411, 14493 (*M. heterodoxa*); Morton, C.V. 3001 (*M. corniculata*); Mosen 4381 (*M. serrulata*); Mostacedo, B. 1209 (*M. crotonoides*); 1762 (*M. serrulata*); 2566 (*M. crotonoides*); 2837 (*M. serrulata*); Mota, N.F.O. 2069 (*M. bidentata*); Mota, R.C. 2138 (*M. hispida*); Mueller, F. 390 (*M. corniculata*); Munhoz, C. 1100, 1273 (*M. bidentata*).
- N Nee, M. 33369 (*M. hispida*); 36184 (*M. crotonoides*); 36195 (*M. hispida*); 36393 (*M. crotonoides*); 37002, 37101, 37714 (*M. hispida*); 39643 (*M. crotonoides*); 39644 (*M. hispida*); 39653, 39693, 39724 (*M. crotonoides*); 39738, 40275 (*M. hispida*); 41104 (*M. serrulata*); 42185 (*M. hispida*); 44877 (*M. corniculata*); 46075 (*M. corniculata*); 46075, 47389 (*M. crotonoides*); 47560 (*M. hispida*); 47580 (*M. crotonoides*); 53606 (*M. hispida*); Nelson, L.O.A. 1461 (*M. salicifolia*); Neto, E.T. 3182 (*M. salicifolia*); Neto, S.R. 613 (*M. anisodonta*); 874 (*M. glandulosa*); Nogueira, E. 56 (*M. hispida*); Novara, L. 5327 (*M. hispida*); Nunes, T.S. 1466 (*M. hispida*).
- O Oldeman 148, 249 (*M. corniculata*); Oldenburger, F.H.F. 339 (*M. corniculata*); 721 (*M. corniculata*); 865 (*M. corniculata*); Oliveira, C.M. 28, 65 (*M. serrulata*); Oliveira, E. 6074 (*M. salicifolia*); Oliveira, F.C.A. 909 (*M. glandulosa*); Oliveira, J.T.A. 7 (*M. corniculata*); Oliveira, P.I. 476 (*M. bidentata*); Oliveira, R.P. 206 (*M. corniculata*);

- Ordoñez, J. 1957 (*M. glandulosa*); Orlandi, R. PCD267 (*M. heterodoxa*); Otacílio, P. 4278 (*M. daphnoides*)
- P Pastore, M. 261, 264 (*M. serrulata*); Paula, J.E. 192 (*M. serrulata*); Paula-Souza, J. 4089 (*M. salicifolia*); 4233 (*M. hispida*); 4435 (*M. ditassoides*); 4475 (*M. bidentata*); 4683 (*M. crotonoides*); 4733 (*M. salicifolia*); 4780 (*M. glandulosa*); 4987, 4987 (*M. uleana*); 5114, 5262, 5263 (*M. salicifolia*); 6009 (*M. corniculata*); 7308 (*M. salicifolia*); Pedersen, T.M. 3292, 6435 (*M. crotonoides*); Pereira, B.A.S. 1464 (*M. bidentata*); Pereira, E. 4187 (*M. crotonoides*); 7656 (*M. glandulosa*); Pereira, M. 736, 738, 815, 816 (*M. daphnoides*); 817 (*M. glandulosa*); Pereira-Silva, G. 4647 (*M. salicifolia*); 5935 (*M. bidentata*); 6173 (*M. salicifolia*); Peron, M. 660 (*M. serrulata*); Petitbon 9, 40, 207 (*M. corniculata*); Philcox, D. 3037 *pro parte* (*M. bidentata*); 3037 *pro parte* (*M. salicifolia*); 3066 (*M. serrulata*); 3241 *pro parte* (*M. bidentata*); 3241 *pro parte* (*M. salicifolia*); 3450, 3451 (*M. serrulata*); 3702 (*M. bidentata*); 3703, 3766 (*M. serrulata*); 3778 (*M. bidentata*); 3928 *pro parte* (*M. corniculata*); 3928 *pro parte* (*M. crotonoides*); 4140 *pro parte* (*M. anisodonta*); 4140 *pro parte* (*M. glandulosa*); 4140 *pro parte* (*M. serrulata*); 4247 (*M. salicifolia*); 4899 (*M. hispida*); 7384, 7439, 7439, 7484, 7766, 7768, 7806 (*M. corniculata*); Pickel, B. 18602 (*M. corniculata*); Pignal 218 (*M. heterodoxa*); Pilger 813 (*M. bidentata*); Pilgeri, R. B 100467638 (*M. corniculata*); Pinto, R.B. 129 (*M. corniculata*); Pirani, J.R. CFCR2150 (*M. uleana*); BHCB 46980 (*M. salicifolia*); 336 (*M. glandulosa*); 340, 421 (*M. hispida*); 691 (*M. glandulosa*); 1306 (*M. bidentata*); 1619 (*M. hispida*); 1660 (*M. salicifolia*); 2185 (*M. bidentata*); 3941A (*M. salicifolia*); 3986 (*M. glandulosa*); 4007 (*M. marginata*); CFSC5719, CFSC5870 (*M. daphnoides*); CFCR8369 (*M. salicifolia*); CFCR10784 (*M. nummularifolia*); CFSC12014 (*M. daphnoides*); 51303 (*M. marginata*); Pires, J.M. 1129, 1161 (*M. corniculata*); 51124 (*M. salicifolia*); Poeppig 2978, 3071 (*M. corniculata*); Pohl 1684, 1692 (*M. serrulata*); 1694 (*M. marginata*); 1695 (*M. salicifolia*); 1700 (*M. glandulosa*); 1718 (*M. hispida*); 1720 (*M. crotonoides*); 1723 (*M. corniculata*); 1730 (*M. crotonoides*); Porto, P.C. 426 (*M. salicifolia*); Pott, A. 8772 (*M. corniculata*); Poveda, A. PCD580 (*M. ditassoides*); Prance, G.T. 4754, 29973 (*M. salicifolia*); Pscheidt, A.C. 61 (*M. daphnoides*); 62 (*M. hispida*); 63 (*M. crotonoides*); 65 (*M. crotonoides*); 66, 67 (*M. daphnoides*); 68 (*M. daphnoides*); 69 (*M. daphnoides*); 70, 71 (*M. hispida*); 72, 73 (*M. glandulosa*); 74 (*M. crotonoides*); 75 (*M. hispida*); 76, 77, 78, 79 (*M. glandulosa*); 80 (*M. salicifolia*); 81 (*M. glandulosa*); 82 (*M. salicifolia*); 85 (*M. hispida*); 86 (*M. hispida*); 87 (*M. daphnoides*); 88 (*M. salicifolia*); 89 (*M. glandulosa*); 90

- (*M. ditassoides*); 108, 112 (*M. bidentata*); 113 (*M. ditassoides*); 116 (*M. bidentata*); 117, 118, 119, 120 (*M. ditassoides*); 122 (*M. bidentata*); 123 (*M. anisodonta*); 125 (*M. salicifolia*); 126 (*M. corniculata*); 139 (*M. salicifolia*); 142 (*M. marginata*); 143 (*M. hispida*); 144 (*M. salicifolia*); 145 (*M. nummularifolia*); 150 (*M. crotonoides*); 151 (*M. salicifolia*); 165 (*M. corniculata*); 169 (*M. nummularifolia*); 170, 171 (*M. salicifolia*); 173 (*M. bidentata*); 174 (*M. anisodonta*); 177 (*M. marginata*); 178, 179 (*M. crotonoides*); 181, 183 (*M. marginata*); 186 (*M. corniculata*); 187 (*M. nana*); 189 (*M. corniculata*); 190 (*M. glandulosa*); 191 (*M. corniculata*); 192 (*M. uleana*); 193 (*M. revoluta*); 198 (*M. heterodoxa*); 199 (*M. corniculata*); 200 (*M. uleana*); 201 (*M. corniculata*); 202, 203 (*M. bidentata*); Pulle-Lutz 1089 (*M. glandulosa*).
- Q Queiroz, L.P. 1249 (*M. heterodoxa*); 2100, 2115 (*M. bidentata*); 4221 (*M. corniculata*); 4303 (*M. heterodoxa*); 4489 (*M. corniculata*); 5184, 5326 (*M. daphnoides*); 5403 (*M. corniculata*); Quevedo, R. 466 (*M. hispida*); 469 (*M. corniculata*); 471 (*M. hispida*); 2514 (*M. serrulata*).
- R Rambo, B. P 4804647 (*M. hispida*); 10122 (*M. corniculata*); 40843, 44425 (*M. hispida*); 46903 (*M. crotonoides*); 51938 (*M. hispida*); Ramos, A.E. 373 (*M. serrulata*); Ramos, J.F. 6676 (*M. corniculata*); Rapini, A. 291, 303 (*M. hispida*); Ratter, J.A. 841 (*M. bidentata*); 862 (*M. serrulata*); 998 (*M. salicifolia*); 2093 (*M. bidentata*); 3100 (*M. hispida*); 3352 (*M. ditassoides*); 3658 (*M. hispida*); 3987 (*M. serrulata*); 4052 (*M. hispida*); 4934 (*M. serrulata*); 7019 (*M. bidentata*); 7033 (*M. serrulata*); Rawitscher, F. 10355 (*M. serrulata*); Raynal, A. 15590, 18660, 18731 (*M. corniculata*); Regnell, A.F. 253 (*M. corniculata*); 1055 (*M. serrulata*); 1057 (*M. bidentata*); 1735 (*M. crotonoides*); Reitz 765 (*M. corniculata*); 17764 (*M. crotonoides*); Resende, U.M. 458 (*M. hispida*); Ribas, O.S. 2331 (*M. serrulata*); Richards, P.W. 6872 (*M. bidentata*); Richardson, W.D. 678 (*M. corniculata*); Riedel s.n. P 4864470, P 4864465, Z 00035795 (*M. bidentata*); P 4804589, P 4804593, Z 35804 (*M. corniculata*); P 4804690, Z 35810 (*M. ditassoides*); P 4804436 (*M. serrulata*); 855 (*M. ditassoides*); Roca, Y. 184 (*M. crotonoides*); Rodrigues, K.F. 396 (*M. heterodoxa*); Rodrigues, R.S. 286 (*M. serrulata*); Rodrigues, S.M. 276 (*M. corniculata*); 831 (*M. salicifolia*); Rodriguez, A. 639 (*M. serrulata*); Rohr, J.P.B. 164 (*M. corniculata*); Rombouts, H.E. 331 (*M. salicifolia*); Romera, E.C. 20 (*M. corniculata*); Roque, A.A. 455 (*M. corniculata*); Rossi, L. 1642 (*M. hispida*).
- S Sagot, T. 504, 904, 1259 (*M. corniculata*); Sagra, R. P 4864405 (*M. serrulata*); Sakuragui, C.M. 199 (*M. glandulosa*); Salzmann s.n., s.n., 487 (*M. corniculata*);

Sampaio, A.B. 294, 330 (*M. ditassoides*); Sampaio, P.S.P. 414 (*M. corniculata*); Sandwith, N.Y. 1040 (*M. corniculata*); Sano, S.M. 8 (*M. corniculata*); Santiago, A.F. 23 (*M. hispida*); Santos, M.R.O. 6 (*M. corniculata*); Sasaki, D. 888 (*M. glandulosa*); 951 (*M. bidentata*); Sastre, C. 283 (*M. corniculata*); Sazima, M. 3849 (*M. bidentata*); Scariot, A.O. 523 (*M. bidentata*); Schinini, A. 4386 (*M. hispida*); 7951, 8318 (*M. crotonoides*); 12399 (*M. hispida*); 13014 (*M. salicifolia*); 20328 (*M. crotonoides*); 25703 (*M. hispida*); Schomburgk 912 (*M. corniculata*); Schulz, J.P. 1964, 9931 (*M. corniculata*); Schwabe, W. B 1000086943 (*M. hispida*); Secco, R.S. 874, 884 (*M. corniculata*); Seidel, R. 14 (*M. serrulata*); 39, 217 (*M. hispida*); 431 (*M. serrulata*); Seijo, J.G. 3270, 3560 (*M. hispida*); Sellow, F. P 4804569 (*M. Glandulosa*) P 4864462 (*M. bidentata*); 1690, 5485 (*M. bidentata*); Semir, J. 2591, 3343 (*M. glandulosa*); 3346 (*M. crotonoides*); 3374 (*M. daphnoides*); 3381 (*M. ditassoides*); 4055, 4178, 4275, 4685 (*M. glandulosa*); 4724 (*M. ditassoides*); 17420 (*M. hispida*); Semir, M. 611, 744 (*M. glandulosa*); Senna, L.R. 131 (*M. corniculata*); Silva, A.S.L. 3479 (*M. corniculata*); Silva, G.P. 3216 (*M. bidentata*); 4441, 4976 (*M. corniculata*); 5469 (*M. ditassoides*); Silva, J.S. 192 (*M. serrulata*); 367 (*M. corniculata*); 800 (*M. glandulosa*); Silva, L.A.M. 464 (*M. heterodoxa*); 2811 (*M. ditassoides*); Silva, L.B. PCD6034 (*M. heterodoxa*); Silva, M. 1303 (*M. salicifolia*); Silva, M.A. 45 (*M. serrulata*); 4005 (*M. salicifolia*); 4317 (*M. corniculata*); 4529 (*M. ditassoides*); Silva, M.F.F. 1123 (*M. corniculata*); Silva, M.M. 147 (*M. glandulosa*); Silva, O.L.M. 15, 19, 41, 43 (*M. serrulata*); 63 (*M. bidentata*); 154 (*M. glandulosa*); 174 (*M. heterodoxa*); 176 (*M. marginata*); Silva, U.C.S. 68 (*M. daphnoides*); Silveira, E. EAC 44998 (*M. uleana*); Silveira, N. 3812 (*M. hispida*); Simonis, E. CFCR4111 (*M. nummularifolia*); Simonis, J.E. 62 (*M. hispida*); Simão-Bianchini, R. 1823 (*M. crotonoides*); Sinmonds, M. 15397 (*M. corniculata*); Siqueira, O.P. 15 (*M. serrulata*); Smith, H.H. 357, 360, 605 (*M. corniculata*); Smith, L.B. 4787 (*M. ditassoides*); 7003 (*M. glandulosa*); 7291 (*M. corniculata*); 9344, 11565 (*M. hispida*); Sobral, M. 5192 (*M. corniculata*); 7526 (*M. serrulata*); 10316, 10326, 10779 (*M. salicifolia*); Solomon, J.C. 6815 (*M. serrulata*); Soria, N. 4933 (*M. corniculata*); Soto, A. 438 (*M. serrulata*); Sousa, G. 362 (*M. corniculata*); Souza, E.B. EAC 35903 (*M. nummularifolia*); 1381 (*M. corniculata*); Souza, V.C. 2580 (*M. serrulata*); 3416 (*M. glandulosa*); 7260, 7427 (*M. hispida*); 8212 (*M. glandulosa*); 8275, 8303, 8329, 8332 (*M. daphnoides*); 8515 (*M. hispida*); 9510, 9580, 9665, 10683 (*M. serrulata*); 10915, 10958 (*M. hispida*); 10960, 20455 (*M. serrulata*); 22436 (*M. corniculata*); Splitgerber 667 (*M. corniculata*); Spruce, R. 212 (*M. corniculata*); St.

- Hilaire, A. B303 (*M. glandulosa*); P 4864457, B1793 (*M. bidentata*); B116 (*M. crotonoides*); B289, B469, B472 (*M. glandulosa*); s.n. (K X), D116, B226, C508 (*M. hispida*); B1623 (*M. marginata*); P 4804627 (*M. hispida*); 141 (*M. serrulata*); 234 (*M. corniculata*); 253 (*M. crotonoides*); 508 (*M. hispida*); 658 (*M. ditassoides*); 908 (*M. daphnoides*); 911 (*M. hispida*); 1244 (*M. daphnoides*); 1526 (*M. hispida*); 1814, 1894 (*M. serrulata*); 2067 (*M. crotonoides*); 2556, 2996 (*M. stipulacea*); Stannard, B. H51595, PCD2624 (*M. corniculata*); 5540 (*M. daphnoides*); H51595 (*M. corniculata*); H51754 (*M. salicifolia*); H51802 (*M. bidentata*); Stehmann, J.R. SP 226980 (*M. corniculata*); Steinbach, J. 2155 (*M. corniculata*); 5052 (*M. crotonoides*); 6361 (*M. hispida*); Steinbach, R.F. 799 (*M. corniculata*); Sthemann, J.R. BHC27701 (*M. hispida*); Sugiyama, M. 426 (*M. serrulata*); Sugiyama, M. 6 (*M. serrulata*); Sá, K.L.V.R. 80 (*M. serrulata*).
- T Takeuchi, C. SP 501 (*M. corniculata*); 85 (*M. marginata*); 93 (*M. glandulosa*); 94 (*M. corniculata*); 96 (*M. glandulosa*); Tameirão Neto, E. 3182 (*M. salicifolia*); 4198 (*M. marginata*); Teague, G.W. 601 (*M. hispida*); Teixeira, W.A. 23915 (*M. hispida*); Teunissen, L.B.B. 16205 (*M. corniculata*); Thomas, W.W. 5780 (*M. glandulosa*); 5906 (*M. serrulata*); Toledo, J.F. SP 23657 (*M. serrulata*); Toledo, M. 549 (*M. hispida*); Torrend, C. 133 (*M. salicifolia*); Tostain, O. 564 (*M. crotonoides*); 3279 (*M. corniculata*); Tozzi, A.M.G.A. 94-36 (*M. serrulata*); Traill, J.W.H. 764 (*M. corniculata*); Tressens, S.G. 2429, 3480 (*M. crotonoides*); Triana, J. 3653 (*M. corniculata*); 3667 (*M. bidentata*); 3828 (*M. corniculata*); Troll, C. 634 (*M. hispida*); Tulleken, J.E. 171 (*M. corniculata*).
- U Ule, E. 3065 (*M. ditassoides*); 7210 (*M. bidentata*); 7450 (*M. corniculata*).
- V Valente, G.E. 950 (*M. serrulata*); Vanni, R. 1321 (*M. serrulata*); Vargas, I.G. 3282, 3515 (*M. serrulata*); Vaudeman, C. 4872 (*M. hispida*); Velez, I. 3379 (*M. corniculata*); Verardo, S.M.S. 23942 (*M. bidentata*); Verhagen, T. 1952 (*M. corniculata*); Viana, R.H.O. 271 (*M. bidentata*); Vidal, C.V. 180 (*M. nummularifolia*); Viegas, A.P. 5945 (*M. bidentata*); Villarroel, D. 1965 (*M. serrulata*); 2032 (*M. corniculata*); Válio, I.F.M. 409 (*M. ditassoides*).
- W Walter, B.M.T. 18 (*M. serrulata*); Wanderley, M.G.L. 271 (*M. hispida*); Warming P 4804414 (*M. hispida*); P 4804602 (*M. corniculata*); P 4864454 (*M. bidentata*); sP 4804692 (*M. ditassoides*); 1528 (*M. hispida*); Webster, G.L. 9891, 24038, 25547 (*M. corniculata*); 25776 (*M. heterodoxa*); Weddell, M.H.A. 549 (*M. glandulosa*); 2582 (*M. serrulata*); 2611 (*M. bidentata*); 3033 (*M. crotonoides*); 3048, 3578 (*M. hispida*);

- Werdermann, E. 2592 (*M. crotonoides*); Werner 426 (*M. corniculata*); Whitton, B.A. 57 (*M. corniculata*); Wildschut, J.T. 11883 (*M. corniculata*); Williams, L.O. 5451 (*M. daphnoides*); 6237 (*M. glandulosa*); Williams, R.S. 353 (*M. corniculata*); Wilson 490 (*M. corniculata*); Wood, J.R.I. 12754, 13298 (*M. hispida*); 14104 (*M. serrulata*); 14308 (*M. hispida*); 15958 (*M. crotonoides*); 18182 (*M. corniculata*); 18519 (*M. serrulata*); 19752 (*M. hispida*); 20373 (*M. salicifolia*); 20374 (*M. hispida*); 20501 (*M. crotonoides*); 20783 (*M. corniculata*); 23575 (*M. hispida*); 23583, 23761 (*M. serrulata*); 24029, 24220 (*M. corniculata*); 25142 (*M. serrulata*); 25380 (*M. hispida*); Woolston, A.L. 471 (*M. hispida*); 926 (*M. corniculata*); 1045 (*M. hispida*); Wright, C. 1979 (*M. corniculata*); Zanini, E. 9 (*M. serrulata*).
- Z Zappi, D.C. 1701, 2020 (*M. daphnoides*); 2154 (*M. ditassoides*); 2357 (*M. crotonoides*); 3075 (*M. salicifolia*); CFCR8383 (*M. nummularifolia*); Zardini, E.M. 37318 (*M. hispida*); 37606 (*M. corniculata*); 39029 (*M. hispida*); 42235 (*M. dasycarpa*); 42388 (*M. bidentata*); 43621, 43637, 44606, 45545, 45552, 46513 (*M. serrulata*); 47975, 49439 (*M. hispida*); 49716 (*M. dasycarpa*); 52271 (*M. serrulata*); 52783, 53704, 55419, 55445, 55527 (*M. hispida*); 55545 (*M. corniculata*); 55861, 59254 (*M. hispida*); 59368 (*M. crotonoides*); 59433 (*M. corniculata*); 59489 (*M. salicifolia*); 59625 (*M. corniculata*); 60615, 60615, 60728 (*M. hispida*).

CAPÍTULO 2

A ser submetido à revista *Phytotaxa* (normas em Anexo 1).

Taxonomic Revision of Extra-American *Microstachys*
(Euphorbiaceae – Hippomaneae)

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ABSTRACT

A taxonomic revision of the extra-American species of genus *Microstachys* based on morphological data from herbaria specimens was carried out. An identification key for the species and descriptions, examined specimens, taxonomic notes, geographic distribution, habitat information, IUCN conservation assessment notes and illustrations are provided for each species. Five species are recognized in this treatment, one of them a new status, four in savannas of Western Africa: *M. acetosella*, *M. dalzielii*, *M. faradianensis*, *M. linearis* and *M. chamaelea*, widely distributed in Africa, Asia and Western Australia, mainly in sandy coastal plains, but also as a ruderal in disturbed areas.

Keywords: *Sebastiania*, taxonomy, savannah, sandy coastal plain.

INTRODUCTION

Microstachys Jussieu (1824: 49) is the largest pantropical genus of the tribe Hippomaneae in Euphorbiaceae (Esser 2001). It grows mostly in coastal and grassland vegetation worldwide, mainly in African savannas (Esser *et al.* 1998, Esser 1999) and South American Cerrado.

Most of the currently species of *Microstachys* has been originally described or included within other genera of Hippomaneae as *Sapium*, *Tragia* and *Sebastiania*. Müller Argoviensis (1866) treated *Microstachys* as a section of *Sebastiania* Sprengel (1821: 118), and was followed by Pax & Hoffmann (1912). Esser (1998) restored *Microstachys* as a genus, hereby including others sections of *Sebastiania*: *Elachocroton* (Mueller 1857: 17) Pax (in Pax & Hoffmann 1912: 114) and *Microstachyopsis* (Müller Argoviensis 1863: 89) Pax (in Pax & Hoffmann 1912: 118).

Species of *Microstachys* are usually easily recognized by its herbaceous to subshrubby habit, the small and dense glandular denticles on the leaf margin, leaf-opposite spiciform inflorescences, ovary and fruit with spiny appendages and seeds with a disc-shaped caruncle (Esser 2001, 2012). Pax & Hoffmann (1912) published the latest complete revision of the tribe Hippomaneae, including *Microstachys* as a section of the genus *Sebastiania*, so most of collections in herbaria around the world are identified with names under *Sebastiania* as so in local floras.

Few studies of the genus in the Paleotropics are known. Esser *et al.* (1998) and Esser (1999) studied the tribe Hippomaneae in Malesia, including *Microstachys*. Thus, the aim of this work is to provide a taxonomy revision of the extra-American species of *Microstachys* as part of a global study of the genus.

MATERIALS AND METHODS

This study was based on herbarium specimens from the following herbaria: B, BM, BR, DNA, E, GOET, K, L, M, NY, P, PERTH and U. Abbreviations are according to Thiers (2013, continuously updated). The species descriptions presented here adopted the morphological nomenclature of Beentje (2012), Harris & Harris (2001) and Stearn (2004). For each species description is given with distribution notes, habitat, IUCN conservation assessment and examined specimens. The distribution notes include TDWG codes according to Brummitt *et al.* (2001). The conservation status follows the IUCN red list categories (IUCN 2001). A full list of specimens is given at the end. The geographic distribution map was produced by QGIS v.2.6.1 (<http://qgis.osgeo.org/>).

TAXONOMIC TREATMENT

Microstachys Jussieu (1824: 48). Type: *Microstachys bicornis* Jussieu (1825: t. 15) [= *Microstachys corniculata* (Vahl 1798: 55) Grisebach (1864: 49)] ≡ *Sebastiania* Spreng. sect. *Microstachys* (A.Juss.) Müller Argoviensis (1866: 1166).

= *Cnemidostachys* Martius & Zuccarini (1824a: 136) – Lectotype (designated by Esser 1998): *Cnemidostachys myrtilloides* Martius & Zuccarini (1824a: 137) [= *Microstachys daphnoides* (Mart. & Zucc.) Müller Argoviensis 1863: 91]] ≡ *Sebastiania* Spreng. sect. *Cnemidostachys* (Mart. & Zucc.) Webster (1967: 38).

= *Elachocroton* Mueller (1857: 17). Type: *Elachocroton asperococcus* Mueller (1857: 17) [= *Microstachys chamaelea* (Linnaeus 1753: 981) Müller Argoviensis (1863: 95)] ≡ *Sebastiania* Spreng. sect. *Elachocroton* (F.Muell.) Pax & Hoffmann (1912: 114).

Monoecious subshrubs to shrubs, with developed underground system, xylopodium-like, with watery white latex. Indumentum of filiform, colorless, multicellular hairs. Underground system lignotuberous, xylopodium-like. Branches cylindric, striated, glabrous to pubescent. **Leaves** alternate, concolor, petiolate; blade chartaceous, brochidodromous to hyphodromous, with basal,

abaxial and marginal crateriform glands, margin serrulate, denticulate to entire, plane to revolute, denticles inclined to adpressed; stipules shortly triangular, undivided, persistent. **Inflorescence** in spiciform thyrsus, leaf-opposite, with numerous staminate cymules distally and 1(3) pistillate cymule proximally; bracts ovate, glabrous, with 1 pair of basal, stipitate and flattened-spheroidal glands, margin entire to lacerate. **Staminate flowers** pedicellate to sessile, pedicel glabrous; sepals 3, free, ovate, glabrous, eglandular, margin lacerate; petals 0; stamens 3, filaments cylindrical, anthers globose. **Pistillate flowers** pedicellate to sessile, pedicel glabrous; sepals 3, free, ovate, glabrous, margin lacerate; petals 0; ovary globose, glabrous, ornate to smooth; stigmas 3, cylindric to sidewardly-flattened, revolute to plane, glabrous. **Fruit** capsule, globose to oblong, glabrous, septicid-loculicid; petiolate to sessile; 3-quetrous columella, apically alate. **Seeds** oblong to subglobose, testa spotted or not; aril 0; caruncle stipitate, disc-shaped or ecarunculate.

The genus has 24 species, 19 in the Neotropics and five in Africa, Asia and Australia. (Fig. 1, Table 1). The center of diversity of extra-American *Microstachys* is tropical Africa: Northeast Africa, in Chad; West Africa, mainly in Ghana and Nigeria, but also in Senegal, Guinea, Ivory Coast, Mali, Togo and Benin; in West-Central Africa, in Cameroon, Central African Republic and Congo and in South Africa in Angola and Zambia. They grow in savannas (Fig. 1), sometimes in boggy grasslands as *Microstachys acetosella* and sandy shallow wetland as *M. linearis*. *Microstachys chamaelea* (L.) Müller Argoviensis (1863: 95) is the most widely distributed extra-American species, occurring in Africa, but also in China, Indian subcontinent (India and Sri Lanka), Indo-China (Coco Island, Myanmar, Thailand, Cambodia and Vietnam), Malay Peninsula (Malaysia, Sumatra, Java and Borneo), Papuasia (Solomon Islands) and in Australia.

Table 1. Distribution of extra-American species of *Microstachys*.

Distribution	Species	Occurrence Area	Habitat
1. Wide	<i>M. chamaelea</i>	Australia, Benin, Cambodia, Cameroon, Central African Republic, China, Ghana, India, Indo-China, Ivory Coast, Malesia, Mali, Myanmar, Nigeria, Papuasia, Sri Lanka, Thailand, Togo, Vietnam	Sandy grassland and alluvial and marine formations.
2. Restricted	<i>M. acetosella</i>	Angola, Congo, Zambia	Sandy watershed plains often seasonally flooded
	<i>M. dalzielii</i>	Ghana, Ivory Coast, Nigeria, Togo	Sandy watershed plains often seasonally flooded
	<i>M. faradianensis</i>	Ghana, Guinea, Mali, Nigeria, Senegal	Watershed plains often seasonally flooded
3. Endemic	<i>M. linearis</i>	Zambia	Sandy grassland

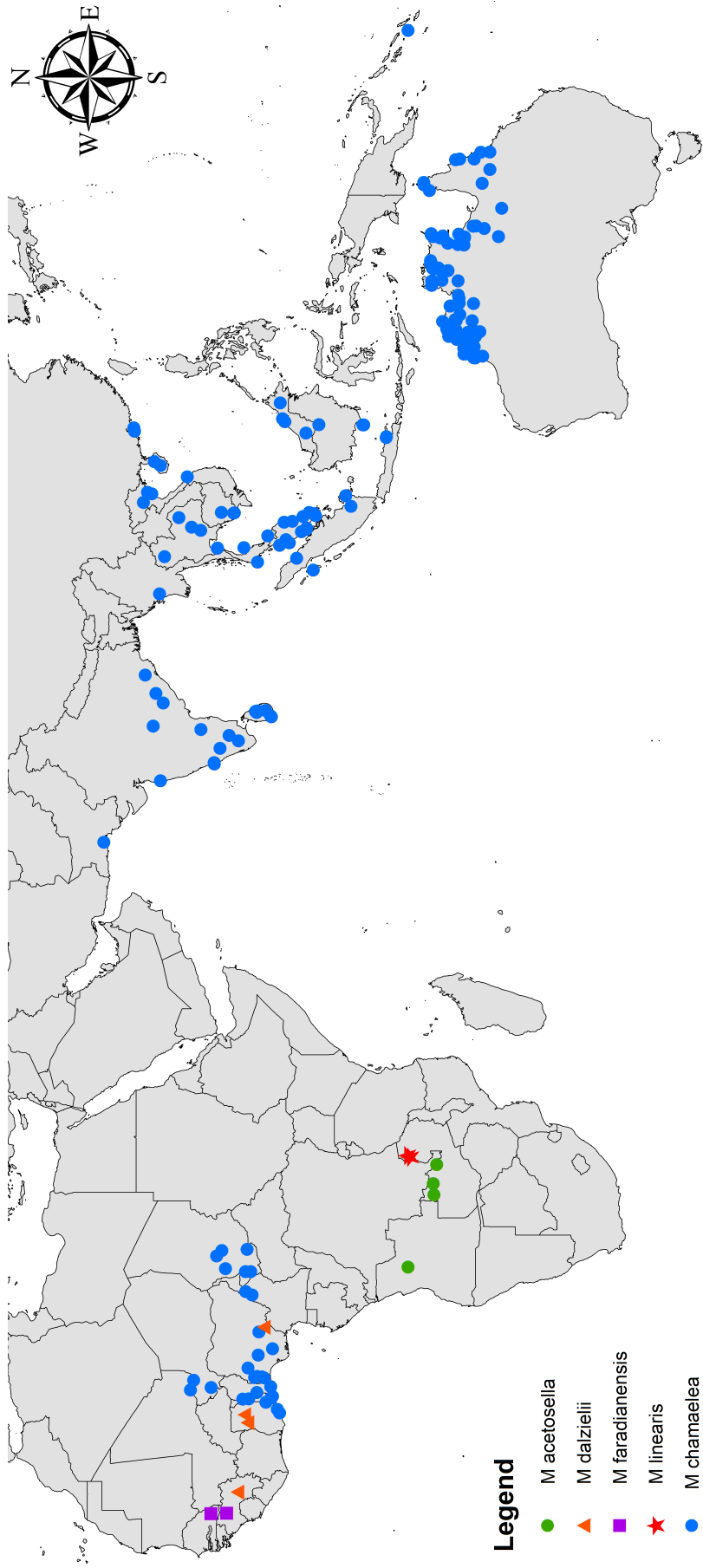


Figure 1. Distribution of extra-American species of *Microstachys*.

Key to the Old world species of *Microstachys*

- 1 Leaves without petiole, venation hypodromous, margin entire; bracts and sepals with cuspidate apex; seeds subglobose *M. linearis*
- Leaves with a short petiole, venation brochidodromous, margin denticulate to serrulate; bracts and sepals with acute to acuminate apex; seeds oblong 2
- 2 Inflorescence pubescent to glabrescent; fruit oblong with appendages in longitudinal rows
..... *M. chamaelea*
- Inflorescence glabrous; fruit globose to oblong with apical appendages or without appendages 3
- 3 Leaf apex acute; margin denticulate, denticles adpressed; staminate cymule with 2-3 flowers; bracts without glands; flowers sessile; fruit without appendages
..... *M. dalzielii*
- Leaf apex rounded to acuminate; margin serrulate, denticles inclined; staminate cymule with 1 flower; bracts with glands; flowers pedicellate; fruit with appendages 4
- 4 Leaf base rounded, apex rounded; stipule acute, pubescent; bracts with acuminate apex; seeds spotted *M. faradianensis*
- Leaf base cuneate to attenuate; apex acuminate; stipule acuminate, glabrous; bracts with acute apex; seeds not spotted *M. acetosella*

***Microstachys acetosella* (Milne-Redhead) Esser (1998: 958)**

(Fig. 2; 3 A-E)

- ≡ *Sapium acetosella* Milne-Redhead (1933: t. 3199) ≡ *Sebastiania acetosella* (Milne-Redh.) Kruijt (1996: 83). Type: — ZAMBIA. Northwestern Province: Mwinilunga, about 16 miles W. of R. Kabompo, 11 September 1930, *E. Milne-Redhead 1105* (holo K!).
- = *Sapium acetosella* var. *elatus* Radcliffe-Smith (1984: 794) ≡ *Sebastiania acetosella* var. *elator* (Radcl.-Sm.) J.-P. Lebrun & Stork (2006: 224). Type: — ANGOLA. Moxico: Few miles W. of R. Mujilezhi, 7 January 1938, *E. Milne-Redhead 3963* (holo K!; iso BM!, BR!).
- = *Sapium acetosella* var. *acetosella* Radcliffe-Smith (1996: 319), *nom. inval.* Lectotype (designated here): — ZAMBIA. Northwestern Province: Mwinilunga, Cha Mwana plain, 14 November 1937, *E. Milne-Redhead 2773* (K!, islecto: BM, PRE). Syntypes: — ZAMBIA. Copperbelt Province: Kitwe, 20 December 1972, *Fanshawe 11714* (K!, NDO, SRGH); Northwestern Province: Solwezi Distr., c. 106 km Solwezi-Nchanga, 1 November 1947, *Brenan & Greenway 8004* (FHO, K!).

Subshrub 6–42 cm tall. **Leaves** petiolate; petiole 1–2 mm long, glabrous; blade lanceolate to oblanceolate, 0.9–3.5 × 0.5–1 cm, glabrous, brochidodromous, 4–5 pairs of inconspicuous secondary veins, with 3–4 pairs of glands, ca. 0.05 mm in diameter, base attenuate to acuminate, margin serrulate, plane to revolute, denticles inclined, ca. 0.5 mm long, apex acuminate; stipules ovate, 0.5 × 0.2–0.5 mm, glabrous. **Inflorescence** 2 cm long, axis glabrous; bracts 0.5 × 0.2–0.3 mm, basal glands 0.5–1 mm in diameter, apex acute, margin entire to lacerate, staminate cymules numerous, pistillate cymules 2(3). **Staminate flower** 1, pedicellate, pedicel 3–3.5 mm long; sepals 1 × 1 mm, apex acute; stamens 1.5 mm long, anthers 0.5 mm long. **Pistillate flower** 1, pedicellate, pedicel 3–3.5 mm long; sepals 1 × 1 mm, apex acute; ovary 1 × 1 mm, ornate; stigmas cylindric, 2 mm long, revolute, glabrous. **Fruit** oblong, 8 × 6 mm; pedicel ca. 3–3.5 mm long; stigmas persistent; 3 horn-shaped appendages on the apex of each mericarp, ca. 0.5 mm long; columella persistent, ca. 6 mm long. **Seeds** oblong, 5 × 4 mm, testa not spotted; carunculate.

Distribution: — *Microstachys acetosella* is found from Congo to Zambia (Govaerts *et al.* 2000). TDWG codes: 23 ZAI 26 ANG ZAM (Fig. 1, Table 1).

Habitat: — Sandy watershed plains often seasonally flooded, in dambos or in its margins in boggy grassland at 1,000–1,500 m elevation.

IUCN conservation assessment: — Vulnerable (VU). This species has a large range and is known from collections from Angola, Congo and Zambia, but without recent collections.

Morphological notes: — *Microstachys acetosella* has partly fused sepals in the male flowers as seen by Esser (1998). It is similar to *M. linearis*, but differs by details of leaves, flowers, fruits and seeds: the first has subsessile leaves (vs. sessile in the latter), venation brochidodromous (vs. hyphodromous) and with serrulate margin (vs. entire), the floral bracts are ovate (vs. lanceolate) with acute apex (vs. cuspidate), the staminate and pistillate sepals have a acute apex (vs. cuspidate), the fruit has long appendages (vs. shorter), the seeds are oblong (vs. subglobose).

Additional specimens examined: — **ANGOLA.** 7 January 1938, *Milne-Redhead, E.* 3963 (K); January 1938, *Milne-Redhead, E.* 4115 (K); **Malange: Capunda**, 12 August 1965, *Henriques, C.* 648 (K, LUAI).

ZAMBIA. **Kitwe** 20 December 1972, *Fanshawe, D.B.* 714 (K); **Mwinilinga** 11 September 1930, *Milne-Redhead, E.* 1105 (K); **Mwinilinga: Cha Mwana**, 7 January 1938, *Milne-Redhead, E.* 3963 (BM, BR, K); **Western Province: Solwezi district**, 1 October 1947, *Brenan, J.P.M.* 8004 et al. (K).



Figure 2. Holotype of *Microstachys acetosella* (E. Milne-Redhead 1105, K!).

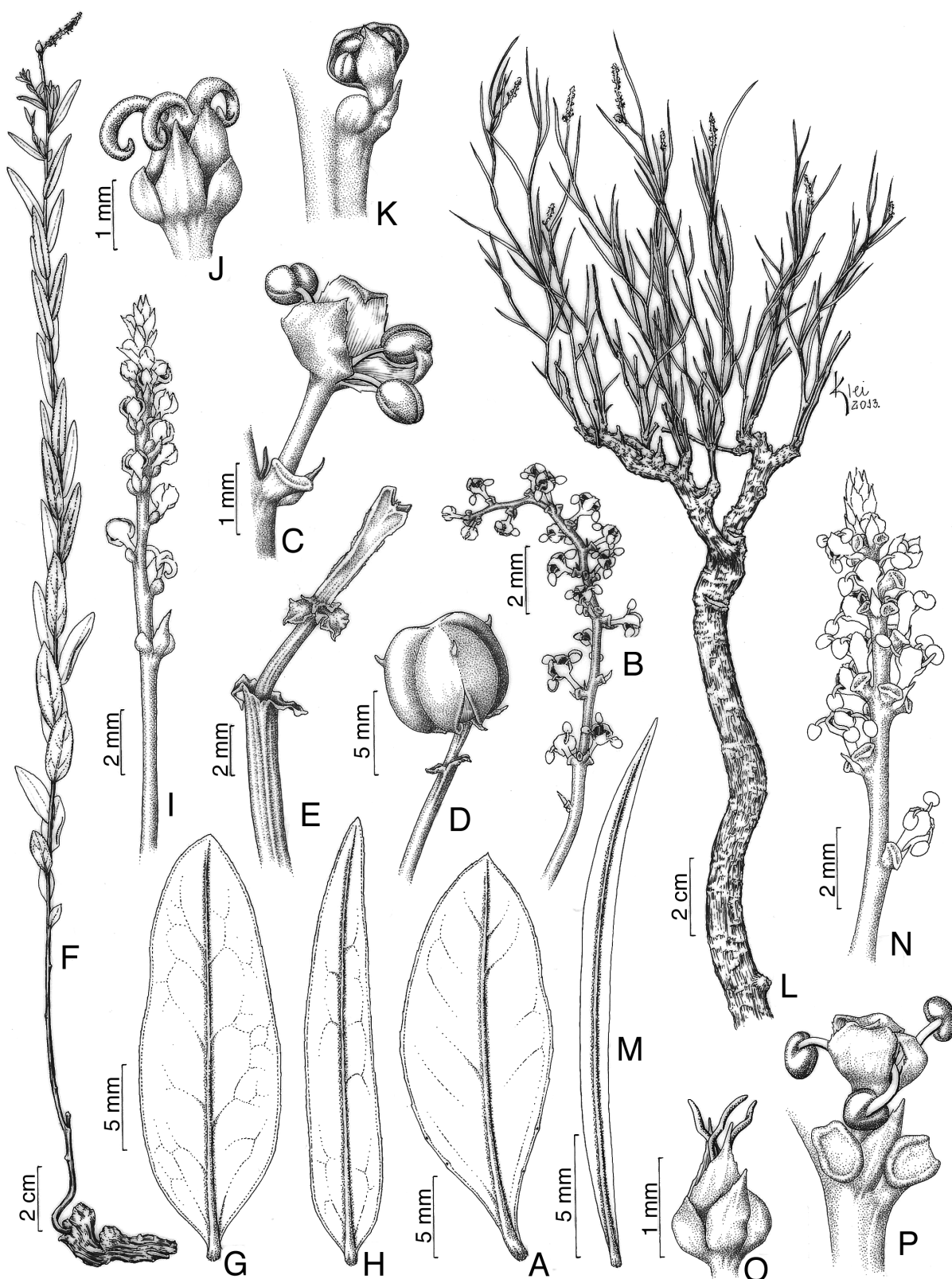


Figure 3. *Microstachys acetosella*. A. Lower side of the leaf. B. Inflorescence. C. Male flower. D. Fruit. E. Columella (J.P.M. Brenan & P.J. Greenway 8004). *Microstachys dalzielii*. F. Habit. G. Lower side of the leaf. H. Lower side of the leaf. I. Inflorescence. J. Female flower. K. Male flower. (C.D. Adams 4157). *Microstachys linearis* L. Habit. M. Lower side of the leaf. N. Inflorescence. O. Female flower. P. Male flower. (H.M. Richards 15392).

***Microstachys chamaelea* (Linnaeus) Müller Argoviensis (1863: 95)**

(Fig. 4 C; 5; 6)

- ≡ *Tragia chamaelea* Linnaeus (1753: 981) ≡ *Microstachys chamaelea* (L.) Jussieu (1824: 49), *nom. inval.* ≡ *Cnemidostachys chamaelaea* (L.) Sprengel (1826: 835) ≡ *Microstachys chamaelea* (L.) Hooker (1859), *nom. inval.* ≡ *Excoecaria chamelaea* (L.) Baillon (1865: 323) ≡ *Sebastiania chamaelea* (L.) Müller Argoviensis (1866: 1175) ≡ *Stillingia chamaelea* (L.) Müller Argoviensis (1866: 1175). Lectotype (designated by Shaw 1980: 686): — “Habitat in India”, 1777, *G. J. Koenig s.n.* (LINN 1103-5!).
- = *Elachocroton asperococcum* Mueller (1857: 17) ≡ *Stillingia asperococca* (F.Muell.) Baillon (1858: 517) ≡ *Sebastiania chamaelea* var. *asperococca* (F.Muell.) Pax & Hoffmann (1912: 116). Type: — AUSTRALIA. Northern Territory: “in locis sterilioribus ad flumen Victoriae”, without date, *F.J.H. von Mueller s.n.* (holo: MEL; iso: K!).
- = *Cnemidostachys linearifolia* Miquel (1861: 460). Type: — INDONESIA. Bangka, “in pratis aridis ad rivulam Muntok”, *Kurz* (as *Amann*) 9 (holo: U!; iso: K!).
- = *Sebastiania chamaelea* var. *chariensis* Beille (1910: 128). Type: — CHAD. Chari, Pays des Saras Ngakéos, 4 July 1903, *A.J.B. Chevalier 9055* (holo P!; iso P!, P!).
- = *Sebastiania chamaelea* var. *africana* Pax & K. Hoffman (1912: 117). Lectotype (designated here): — TOGO. Lome, 1900–1902, *O. Warnecke 186* (M!; isolecto BM!, BR, GOET!, K!).

Subshrub 30–60 cm tall. **Leaves** petiolate; petiole 0.5–8 mm long, glabrous to velutinous, hairs ca. 0.4 mm long; blade elliptic, 1–7.5 x 0.15–2 cm, glabrescent to pilose, abaxially in the midrib, sometimes also all over the blade, hairs ca. 0.4 mm long, brochidodromous, 6–18 pairs of inconspicuous secondary veins, with 1–2–(4) pairs of glands, 0.1 mm in diameter, base cuneate, margin serrulate, plane, denticles adpressed, 0.2–0.4 mm long, apex rounded; stipules ovate, 1–1.5 x 0.5 mm, glabrescent to pilose, hairs 0.4 mm long. **Inflorescence** 1–9 cm long, axis pubescent to glabrescent, at the base, hairs 0.2 mm long; bracts 0.5 x 0.5 mm, basal glands 0.5 mm in diameter, apex acuminate, margin lacerate, staminate cymules numerous, pistillate cymule 1. **Staminate flower** 1, pedicellate, pedicel ca. 1 mm long; sepals 0.5 x 0.3 mm, apex acuminate to acute; stamens 0.7 mm long, anthers 0.3–0.5 mm long. **Pistillate flower** 1, pedicellate, pedicel ca. 1 mm long; sepals 1 x 0.5 mm, apex acuminate; ovary 1.5 x 1 mm, ornate; stigmas cylindric, 0.5–1 mm long, revolute, glabrous. **Fruit** globose, 0.5 x 0.5 cm; pedicel ca. 1 mm long; stigmas persistent;

(0–)5 horn-shaped appendages on the entire surface of each mericarp, ca. 0.2–0.5 mm long; columella persistent, ca. 0.4–0.5 mm long. **Seeds** oblong, 5–6 x 5–6 mm, testa mottled; carunculate.

Distribution: — *Microstachys chamaelea* is the extra-american widest distributed species in the genus and occurs from Western Africa to Western Australia. TDWG codes: 22 BEN GHA IVO MLI NGA TOG 23 CAF CMN 24 CHA 36 CHH CHS 40 IND SRL 41 AND CBD MYA THA VIE 42 BOR JAW MLY SUM 43 SOL 50 NTA QLD WAU (Fig. 1, Table 1).

Habitat: — In sandy soil of watershed plains often seasonally flooded and coastal vegetation, as weed in sorghum fields in Africa and in rice fields in Asia.

IUCN conservation assessment: — Least Concern (LC). This species has a large range, is locally common and has recent collections.

Morphological notes: — *Microstachys chamaelea* is the most widely distributed species in the genus. In Africa it is similar to *M. faradianensis* but has adpressed leaf margin in its leaves (Fig. 4 C), pubescent to glabrescent inflorescence, cylindrical stigmas and long fruit appendages, whereas the latter has inclined and non-adpressed margin, glabrous inflorescence, flattened stigmas and shorter fruit appendages.

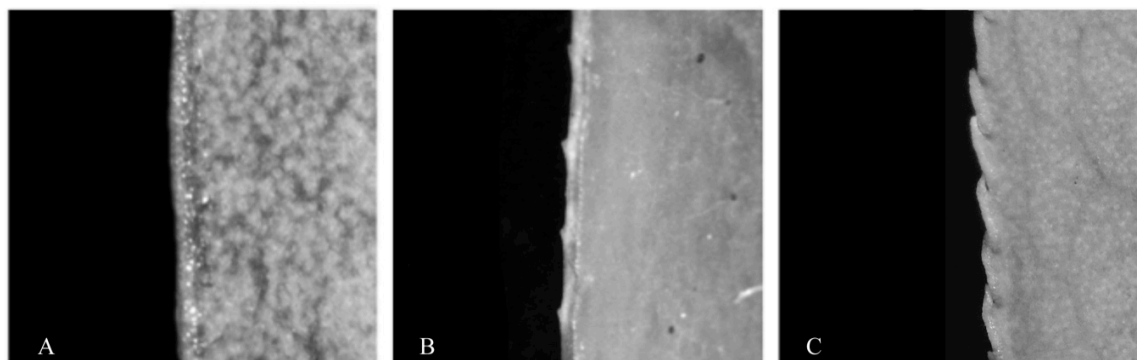


Figure 4. Variation in the leaves margins. A. Entire (*Microstachys linearis*). B. Denticulate (*M. dalzielii*). C. Serrulate (*M. chamaelea*).

Additional note: — According to the label of a collection from Malaysia made by D. Awa S47489 (K!) the natives use *Microstachys chamaelea* to treat “swollen part due to external force” and the method: “the leaves are powdered and added a bit of honey, then poultice on the affected part. Boil the root in water with a bit of salt, then drink”. There is no study about the medicinal properties of this species.

Additional specimens examined: — **AUSTRALIA.** 12°38' S, 132°53' E, 21 February 1973, *Adams, L.G.* 3045 (CANB, K, L); February 1923, *Brass, L.J.* 287 (CANB); 25 April 1948, *Brass, L.J.* 18403 (K, L); 12°24'58" S, 136°53'02" E, 20 February 1994, *Brennan, K.* 2556 (DNA); 14 November 1802, *Brown, R.* 3556 (BM); 12°26' S, 136°41' E, 20 June 1972, *Byrnes, N.* 2669 (CANB, DNA, K, NT); 18 May 1956, *Chippendale, G.* 2077 (CANB); 12 March 1959, *Chippendale, G.* 5541 (L); 11 February 1976, *Craven, L.A.* 3842 (L); 1819, *Cunningham, A.* 281 (BM, K); 14°17' S, 135°43' E, 8 July 1972, *Dunlop, C.R.* 2724 (DNA); 25 May 1970, *Fagg, M.* 730 (K, L); April 1905, *Fitzgerald, W.V.* 304 (PERTH); 18°16' S, 142°40' E, 5 April 1992, *Halford, D.* Q 983 B (AD, BRI, DNA, K, MEL); 26 January 1972, *Hyland* 5844 (K, L); 6 June 1974, *Kanis, A.* 1739 (L); 14 February 1950, *Langfield, E.L.B.* 166 (CANB); 12°47' S, 136°19' E, 18 June 1972, *Latz, P.K.* 2844 (CANB, NT); 16 April 1955, *Lazarides* 5074 (K, L); 23 February 1973, *Lazarides* 7814 (K, L); 16 June 1972, *Maconochie, J.R.* 1473 (CANB, NT); 16 June 1973, *Maconochie, J.R.* 1473 (DNA); 18°39' S, 137°15' E, 27 March 1981, *Maconochie, J.R.* 2586 (DNA); 26 January 1973, *Martensz, P.* AE 601 (BRI, CANB, DNA, NT); 26 January 1973, *Martensz, P.* AE 601 (DNA); 14 February 1961, *McKee, H.S.* 8408 (K, L); 18 February 1961, *McKee, H.S.* 8551 (K, L); 17°23'50" S, 123°37'24" E, 10 February 1992, *Mitchell, A.A.* 2071 (BROOME, DARWIN, PERTH); 15°47' S, 129°05' E, 22 September 1975, *Mitchell, A.S.* 349 (DNA); *Mueller, F.* 0 (K, P); *Mueller, F.* s.n. (K); 17 September 1974, *Must* 1280 (K, L); 13 June 1990, *Neldner*; *Clarkson, J.R.* 2969 (L); 15 June 1964, *Nelson* 1189 (K, L); 24 October 1974, *Parker, M.* 519 (K, L); 12°36' S, 131°06' E, 8 November 1978, *Rankin, M.O.* 1542 (CBG, DNA); 12°18' S, 133°16' E, 24 April 1979, *Rankin, M.O.* 2171 (CANB, DNA, MEL); 26 May 1947, *Royce, R.D.* 1945 (PERTH); 13°59' S, 136°28' E, 7 March 1988, *Russell-Smith, J.* 5149 et al. (DNA); March 1870, *Sekultz, F.* 539 (K); 4 September 1960, *Smith, L.S.* 11019 (K, L); 9 April 1948, *Specht, R.L.* 207 (K, L); 28 October 1948, *Specht, R.L.* 1296 (K, L); 16°04' S, 135°22' E, 6 May 1985, *Wightman, G.* 1848 et al. (BRI, CANB, DNA, K); 9 January 1965, *Wilson, I.B.* 62 (K, L); 6 February 1965, *Wilson, I.B.* 283 (K, L); **Northern Queensland: Bloomfield**, 4 September 1960, *Jones, W.T.* 1565 (CANB); **Northern Territory: Arnhem Land Aboriginal Reserve**, 9 April 1948, *Specht, R.L.* 207 (K); **Northern Territory: Darwin & Gulf district**, 14°20' S, 132°25' E, 24 February 1990, *Evans, M.* 2949 (CANB, DNA, K, MEL); **Northern Territory: Gulf of Carpentaria**, 9 April 1948, *Specht, R.L.* 207 (CANB); **Northern Territory: Victoria River district**, 15°35' S, 131°06' E, 16 April 1987, *Purdie, R.W.* 3254 (CANB, CBG, DNA); **Northern Territory: Butterfly Gorge**, 15°37'34" S, 135°27'38" E, 19 April 2008, *Randall, D.J.* 757 (K); **Queensland: Cape York**, 25 April 1948, *Brass, L.J.* 18403 (K); **Queensland: Cook**, 15°07' S, 145°13' E, 3 February 1984, *Clarkson, J.R.* 5205 (BRI, K, NSW, QRS); **Queensland: Little**

Lagoon, Groote Eylandt, 9 April 1948, *Specht, R.L.* 207 (K); **Queensland: North Kennedy district**, 17°23' S, 145°21' E, 1 June 1983, *Conn, B.J.* 1272 et al. (BRI, CANB, MEL); **Western Australia: Mt Percy**, 17°38' S, 124°55' E, 11 June 1988, *Wilson, P.G.* 12822 (PERTH, SP); **Western Australia: Broome**, 7 August 1965, *Beaublehole, A.C.* ACB 11256 (NSW, PERTH); **Western Australia: Central Kimberley**, 17°00'47" S, 126°41'53" E, 23 April 2005, *Cooper, W.* MULE 467 et al. (MORP, PERTH); **Western Australia: Dampier Botanical District**, 17°22' S, 123°40' E, 18 April 1985, *Aplin, T.E.H.* 5 et al. (CANB); **Western Australia: Derby**, 17°21'55" S, 123°40'51" E, 2 May 2000, *Mitchell, A.A.* 6182 (BRI, BROOME, PERTH); **Western Australia: Dog Chain Creek**, 17°09' S, 125°14' E, 15 June 1988, *Wilson, P.G.* 12919 (PERTH, SP); **Western Australia: East Kimberley**, 1 March 1952, *Langfield, E.L.B.* 256 (PERTH); **Western Australia: Fitzgerald Botanical District**, 15°57' S, 127°12' E, 28 April 1985, *Aplin, T.E.H.* 652 et al. (CANB); **Western Australia: Kimberley Region**, 17°05' S, 124°36' E, 4 May 1988, *Cranfield, R.J.* 6715 (PERTH); **Western Australia: Kununurra**, 8 March 1978, *Aplin, T.E.H.* 6237 (CANB, K, PERTH); **Western Australia: Leopold Range**, 17°18' S, 125°23' E, 27 April 1988, *Cranfield, R.J.* 6572 (PERTH, SP); **Western Australia: Napier Range**, 17°05' S, 124°36' E, 4 May 1988, *Cranfield, R.J.* 6715 (PERTH, SP); **Western Australia: North Coast**, 13°56' S, 126°33' E, 30 June 1973, *Wilson, P.G.* 11189 (PERTH); **Western Australia: North Kimberley**, 14°04' S, 125°48' E, 22 April 1977, *George, A.S.* 14473 (CANB, K, LE, PERTH); **Western Australia: SW Kimberley**, 16°23' S, 122°56' E, 22 July 1981, *Kenneally, K.F.* 7635 (PERTH); **Western Australia: W Kimberley**, 16°26' S, 123°05' E, 22 March 1992, *Carter, B.J.* 506 (BRI, DNA, PERTH); **Western Australia: W. Kimberley Coast**, 16°25' S, 123°11' E, 12 June 1982, *Kenneally, K.F.* 8306 (PERTH); **Western Australia: Walcott Inlet**, 16°25' S, 124°25' E, 24 March 1994, *Mitchell, A.A.* 3527 (BRI, BROOME, PERTH).

BENIN. 1 September 1964, *Adjanohoun, E.J.* 276 (K); **Dahomey: Cotonou**, November 1901, *Poisson, E.* 131 (P); **Dahomey: Guidah**, 31 August 1964, *Adjanohoun, E.J.* 206 (P); **Haut Dahomey: Kakayakou**, 9 November 1915, *Gironcourt* 213 (P); **Salles Mont** 23 February 1908, *Fonkim* 17 (P).

BORNEO. 27 October 1915, *Clemens, M.S.* 9756 (K); 27 January 1954, *Darnton* 33 (BM); 13 October 1989, *Forman, L.L.* 861 (K, L, SAR); February 1894, *Haviland, G.D.*; *Hose* 3709 (BM, K, L, SAR); 10 September 1985, *Madani, L.*; *Ismail* 111375 (K); 23 February 1949, *Sinclair* 5617 (E, K).

BRUNEI. 22 March 1993, *Coode, M.J.E.*; *Ferguson, E.* 7325 (K); 26 October 1989, *Forman, L.L.* 1101 (K, L, SAR); 20 December 1964, *Niel* 3440 (L); **Belait: Luagan Lalak**, 4°30'

S, 114°28' E, 13 October 1989, *Forman, L.L.* 861 (K); **Belait: Lumut Beach**, 4°40' S, 114°28' E, 26 October 1989, *Forman, L.L.* 1101 (K); **Meragang** 5°01' N, 115°01' E, 22 March 1993, *Coode, M.J.E.* 7325 (K); **Tutong: Telisai**, 7 January 1994, *Coode, M.J.E.* 7757 (K).

BURMA. January 1903, *Shaik Mokim* 1109 (G).

CAMBODJA. December 1875, *Harmand* 716 (P); September 1874, *Pierre, L.* 0 (A, E, K); 24 October 1927, *Poilane* 14396 (P); **Kampot** May 1874, *Pierre, L.* s.n. (K).

CAMEROUN. **Poli: Hoséré Godé**, 30 September 1967, *Jacques-Felix, H.* 8424 (P); **Sanguéré** 24 November 1984, *Rippstein, G.* 2307 (P).

CEYLON. *Ehwaiter, M.* 2132 (P); *Huvaites* 2132 (BM); *Jussieu, A.* 2132 (K); 9 August 1974, *Kostermans* 25362 (B, K, S); 15 February 1980, *Maesen* 4149 (K); 20 December 1970, *Ripley, S.* 361 (K); *Thwaites* 2132 (BM, K, W); *Waddler* s.n. (K); *Waddler* s.n. (K); 1846, *Walker* 0 (G, GH); **Badulla** 27 June 1931, *Simpson, N.D.* 8307 (BM); **Hinidumkande: Hiniduma**, 9 August 1974, *Kostermans* 25362 (P); **Polonnaruwa** 20 December 1970, *Ripley, S.* 361 (K).

CHAD. 18 August 1964, *Audru, J.* s.n. (B, K, NY, P); 18 August 1964, *Audru, J.* 834 (P); **Ba Hlli** 23 September 1966, *Audry, P.* B36 (P); **Chari: Baguirmi**, 9 September 1903, *Chevalier, A.* 9775 (P); **Déli** 15 September 1966, *Audry, P.* A41 (P); **Est N'Galo** 8 September 1968, *Gaston, A.* 1893 (P); **Golé** 16 October 1968, *Fotius, G.* 1086 (P); **Kélo**, *Platiel* 96 (P); **Rzendi c Kouwra** 25 August 1968, *Gaston, A.* 1644 (P); **Sarh**, *Palayer* 429 (P).

CHARI. **Lac fittri** 6 September 1903, *Chevalier, A.* 9775 (K); **Loulha** 4 July 1903, *Chevalier, A.* 9055 (K).

CHINA. July 1932, *Fung, H.* 20308 (K); November 1889, *Henry, A.* s.n. (K); *HuFt* 22 (K); 18 January 1934, *Lau, S.K.* 3180 (GH); 25 March 1934, *Lau, S.K.* 3564 (GH); 8 April 1936, *Lau, S.K.* 26156 (A); 23 September 1932, *Lei, C.I.* 3 (A, B, K); 12 August 1933, *Lei, C.I.* 929 (A, K); *McClure, F.A.* 7659 (K); 6 April 1922, *McClure, F.A.* 8859 (G); June 1840, *Suriikoe, R.* s.n. (K); 9 May 1928, *Tsang, W.T.* 339 (A, K); 20 August 1927, *Tsang, W.T.* 519 (G, K); **Canton: Nodoo**, 12 October 1921, *McClure, F.A.* CCC7569 (BM); **Ch'ang-kiang: Ue Lung Shan**, 18 January 1934, *Lau, S.K.* 3180 (P); **Ching Mai: Ku Tung**, 12 August 1933, *Lei, C.I.* 929 (K); **Ching Mai: Mei Maan**, 23 September 1932, *Lei, C.I.* 3 (K); **Hai Nan: Dun Zhou**, 23 July 2002, *Ping, M.* 9065 (K); **Hainan: Hoi 'han**, June 1863, *Bullock* 10136 (BM); **Hainan: Lakeow**, May 1935, *How, F.C.* 72289 (BM); **Hainan: Liamui (Leng Mun)**, July 1935, *Linsley Gressitt, J.* 1161 (Z); **Hainan: Vo Lau**, July 1935, *Linsley Gressitt, J.* 913 (Z); **K'iung-shan: Kiung-chow**, 30 July 1932, *Fung, H.* 20308 (BM); **Kan-en: Chim Fung Ling**, 25 March 1934, *Lau, S.K.* 3564 (P);

Leng Mun: Liamui, July 1935, *Gressitt, J.L.* 1161 (BM); **Leng Mun: Vo Lau**, July 1935, *Gressitt, J.L.* 913 (BM); **Macao: Mane**, June 1863, *Hance, H.F.* 1013B (K); **Ngai: Fung Leng**, 6 September 1932, *Lau, S.K.* 483 (BM); **Taam Chau-Lam Ko: Lin fa Shan**, 9 May 1928, *Tsang, W.T.* 339 (K); **Taam-chau: Sha Po Shan**, 20 August 1927, *Tsang, W.T.* 519 (K); **Tan: I Kap Shan**, 24 February 1933, *Lau, S.K.* 1148 (BM); **Tan: I Kap Shan**, 24 February 1933, *Lau, S.K.* 1148 (P); **Yaichow** 1932, *Chun, N.K.* 44795 (P).

GHANA. 1927, *Irvine, F.R.* 569 (K); 12 November 1954, *Wacri, N.K.L.* 3941 (K); **Achimota** June 1961, *Irvine, F.R.* 5023 (K); **Amedzofe** 19 November 1956, *Norton, J.H.* A2294 (K); **Gold Coast: Pokoase**, 12 November 1954, *Lovi, N.* 3941 (P); **Medea** 8 November 1953, *Norton, J.H.* s.n. (K); **Olokemeji** 13 June 1971, *Lowe, J.* 2252 (K); **Onginan: Winneba**, 20 June 1965, *Hall, J.B.* 3132 (K).

INDIA. 2 November 1904, *Barber, C.A.* 6752 (K); 15 September 1939, *Barnes* 772 (A); *Beddome, R.H.* 7429 (BM); *Beddome, R.H.* 7430 (BM); 18 November 1987, *Charles, M.* 51373 (K); 25 September 1921, *Chatianju, B.* 5935 (K); 22 October 1893, *Cladler, C.B.* 20949 (K); 14 December 1989, *Duthie, J.F.* 9744 (JE); February 1883, *Gamble, J.S.* 11169 (K); February 1884, *Gamble, J.S.* 13827 (K); September 1884, *Gamble, J.S.* 14595 (K); August 1884, *Gamble, J.S.* 20864 (K); 10 October 1902, *Haines, H.H.* 502 (K); *Hohenacker, R.F.* 830 (A, B, G, HBG, K, L, M, P, REG, TUB, U, W); 1851, *Hohenacker, R.F.* 831 (G, HBG, HOH, K, M, REG, S, STU, TUB, U, W); 1833, *Hooker* 0 (BR); 27 October 1970, *Jarrett, F.M.*; *Ramamoorthy* 1072 (K); 25 September 1920, *Karayauaswawi, V.* 63 (K); 16 December 1893, *Lawson, M.A.* 110 (K); October 1908, *Meebold* 9821 (WRSL); 1851, *Metz* 830 (TCD); *Nallich* 7797 (BM); 6 August 1979, *Paramasivan, G.* 24182 (K); 1835, *Perrotet* 0 (A, G); 1838, *Perrotet* 33 (G); *Perrotet* 486 (G, W); *Perrotet* 1077 (G); 11 June 1913, *Rao, R.* 1226 (K); *Stocks, L.a.w.*; 0 (TCD, W); *Thomson, G.* s.n. (BM); *Thomson, G.* s.n. (K); *Thomson, G.* s.n. (M); *Thomson, G.* 0 (BR, GOET, KIEL, O, S, STU, TCD, U, W); 1845, *Thomson, G.*; *Thomson, G.* 0 (K); *Wallich Cat.* 7797 (BM, K); 1872, *Watt, G.* 0 (E); 20 December 1877, *Watt, G.* 8 (E); 1852, *Wight* 264 (K); 1866, *Wight* 2643 (M); September 1852, *Wight* 2643 (GOET, LISU, M, S, W); **Bastar: Kamharras**, 4 October 1940, *Mooney, H.F.* 1591 (K); **Behar** 28 December 1876, *Clarke, C.B.* 31843 (BM); **Canara: Mangalor**, 1851, *Hohenacker, R.F.* 831 (BM); **Chaurla** 14 December 1889, *Duthie, J.F.* 9744 (BM); **Chota-Nagpore** November 1880, *Gamble, J.S.* 8653 (K); **Isivanidrum** 16 December 1893, *Lawson, M.A.* 110 (K); **Kalahandi: Orissa**, 20 January 1943, *Mooney, H.F.* 2168 (K); **Kamataka: Mangalor**, 1851, *Hohenacker, R.F.* 830 (M); **Madras: Cuddapah**, February 1883, *Gamble, J.S.* 11169 (K); **Madras: Ganjam**, February 1884, *Gamble, J.S.* 13827 (K); **Mahe** 22 February 1892, *Deschamps*,

M. s.n. (P); **Mangalor** 1851, *Hohenacker, R.F.* 831 (K); **Maratha: Bombay**, 11 August 1879, *Young, A.P.* s.n. (BM); **Mysore: Hassan**, 27 October 1970, *Jarrett, F.M.* HfP1072 (K); **Namakkal: Salem Kolli**, 6 August 1979, *Paramasivan, G.* RHT24182 (K); **Periakulam: Madurai Kumbakkarai**, 18 November 1987, *Charles, M.* RHT51373 (K); **Rawpo Hills** 25 September 1920, *Karayauaswawi, V.* 63 (K); **Shevaray: Salem**, October 1897, *Bourne, A.G.* s.n. (K); **Talcher: Orissa**, 15 December 1940, *Mooney, H.F.* 1641 (K); **Travancore** 11 June 1913, *Rao, R.* 1226 (K); **Travancore: Veli**, 2 November 1906, *Barber, C.A.* 6752 (K); **Tunlodam** 7 November 1883, *Clarke, C.B.* 34311 (BM).

INDOCHINA. July 1927, *Clemens, J.*; *Clemens, J.* 3006 (BM, Z); 1885, *Couderc, P.* s.n. (P); 1885, *Couderc, P.* s.n. (P); 1885, *Couderc, P.* s.n. (P); 1885, *Couderc, P.* 0 (P); 5 November 1924, *Evrard* 1713 (K, P); 2 November 1925, *Evrard* 2382 (P); 2 November 1925, *Evrard, F.* 2382 (P); July 1876, *Harmand* 653 (P); **Annam: Tourane**, 19 January 1903, *Bois, D.* 694 (P); **Caiuvá: Makrans**, January 1957, *Ho, P.H.* 5820 (P); **Cochinchine**, *Thorel* 1475 (BM); **Hua Hin** 5 August 1920, *Marcan, A.* 357 (BM); **Pahnthout** 5 November 1924, *Evrard, F.* 1713 (P); **Phanthiet** 5 November 1924, *Evrard, F.* 1713 (K); **Saigon** 21 October 1920, *Evrard, F.* 171 (P); **Siam: Hua Hin**, 5 August 1920, *Marcan, A.* 387 (BM); **Siam: Pala Ionj Chai**, 25 May 1923, *Kerr, A.F.G.* 8102 (BM); **Tourane** July 1927, *Clemens, J.* 3006 (BM).

INDONESIA. 26 March 1915, *Backer* 20601 (K); 17 October 1927, *Bünnemeijer* 1558 (L); *Teysmann, J.E.* s.n. (K); **Bangka**, *Kurz* 9 (K, U).

JAVA. 9 December 1936, *Altmann* 456 (L); *Backer* 4578 (G, K, L, U); 1 September 1914, *Backer* 15334 (L); *HorsField, T.* 70 (K); 14 April 1911, *Leeuwen-Reynvaan, D.* 0 (U); July 1919, *Rant* 0 (L); **Banjoirmas** 1912, *Backer* 4578 (P).

LANTAO ISLAND. August 1886, 0 (K).

MADOERA. 26 February 1915, *Backer* 18988 (K, L); 25 February 1915, *Backer* 19299 (L); 26 March 1915, *Backer* 20681 (K, L).

MALAYSIA. 23 August 1961, *Burkill, H.M.* 2755 (K); 26 April 1959, *Carnick, J.*; *Enoch, I.C.* 215 (SAR); 15 November 1979, *Chin* 2152 (L); 14 June 1932, *Corner, E.J.H.* 25782 (K); *Cunning* 2324 (L); 1821, *Cunning* 2329 (K); *Curtiss, A.H.* 0 (BM); *GriFFith, W.* 4712 (K); 20 January 1918, *Haff, T.* 3030 (K); *HorsField, T.* 0 (BM); 17 July 1959, *Kadim; Noor* 332 (K, L); *Maingay, A.C.* 1401 (K, L); 21 September 1955, *Purseglove; Shah, M.* 4613 (K, L, SAR); August 1919, *Ridley, H.N.* 14518 (BM); 20 May 1961, *Shah, M.*; *Kadim* 973 (K, L, SAR); 16 October 1967, *Shimizu; Fukuoka* 14738 (L); *Smith, C.* 106 (BM); 23 May 1938, *Spare, G.H.* 34564 (K); 18

June 1989, *Swanborn* 890 (L); 16 October 1967, *Teo, L.E.*; *P.* 483 (K, L); June 1941, *Ward, F.K.* 0 (K); 18 April 1987, *Worthington* 12748 (L); 28 October 1899, *Yapp* 366 (K); **Johor: Pengerang**, 12100°00' N, 1041116°00' E, 11 August 2014, *Ali, I.* 2014-280 (SING, SP); **Malacca** 1841, *Cunning* 2324 (BM); **Pangkor** 5 July 1955, *Burkill, H.M.* HMB168 (K); **Penang**, *Curtiss, A.H.* s.n. (BM); **Perak: Rivala Kewerciq**, August 1909, *Ridley, H.N.* 14518 (BM); **Pohang: Bebai**, 14 June 1937, *Corner, E.J.H.* 25782 (K); **Sabah: Beaufort**, 10 September 1985, *Madani, L.* 111373 (K); **Sabah: Sandakan**, 8 April 1984, *Sundaling, D.* 55982 (AA, BO, K, KEP, L, OX, SAR, SING); **Sarawak: Santubong**, 28 February 1954, *Brooke, W.M.A.* 8156 (BM); **Singapore** 20 January 1918, *HawFF* 3030 (K); **Singapore: Pulau Senang**, 8 August 1967, *Kiah, S.* S97 (K); **Telok Batak** 9 May 1973, *Teo, L.E.* 483 (K); **Trengganu** 28 October 1899, *Yaph, R.H.* s.n. (K).

MALI. 25 August 1955, *Sanso* s.n. (P).

NIGER. 1859, *Barter* 1492 (P); 1843, *Vogel* 51 (K); **Brousse Lateufique: Antropée**, *Marchal, A.* s.n. (P); **Dosso: Sable**, 6 December 1967, *Fabriegues, P.* 2653 (P); **Faga-Beri** 16 October 1968, *Boudet, G.* 5065 (P); **Kiere** 14 October 1968, *Boudet, G.* 4951 (P); **Niamey** 15 August 1967, *Fabriegues, P.* 2461 (P).

NIGERIA. 18 January 1955, *Civombe, D.E.* 129 (P); 18 March 1955, *Coombe, D.E.* 129 (K); 1912, *Dalziel, J.M.* s.n. (BM); 1906, *Dalziel, J.M.* 72 (K); *Dalziel, J.M.* 160 (K); February 1902, *Dawodu, J.B.* 287 (K); 1962, *Gillett, J.B.* 15208 (K); 6 September 1965, *Killick, H.J.* 254 (K); 1 December 1949, *Meikle, R.D.* 683 (K); 11 June 1963, *OkaFor, J.C.* s.n. (K); 18 September 1908, *Pausins, A.C.* s.n. (K); 1911, *Thomas, N.W.* 711 (K); 1911, *Thomas, N.W.* 1064 (K); 1911, *Thomas, N.W.* 1380 (K); *Vogel* s.n. (K); 20 September 1971, *Wit, G.* 442 (K); **Abeokuta** 6 September 1965, *Kellick, H.J.* 254 (P); **Benue** September 1910, *Talbot, P.A.* s.n. (BM); **Iseyin** 22 July 1962, *Gillett, J.B.* 15208 (P); **Kabba** 7 June 1958, *Daramola, B.O.* 36934 (K); **Kwara: Igala**, 9 May 1973, *Olorunfemi* 2089 et al. (FHI, K); **Olokemeji** 6 October 1959, *Jackson, G.* 2323 (K); **Onitsha: Awka**, 10 September 1942, *Jones, A.P.D.* 5880 (K); **Oyo: Ibuya-Shepeteri**, 8°26' N, 3°45' W, 28 July 1971, *Geerling, C.* 3860 (M); **Kwara: District of Igala**, 9 May 1973, *Olorunfemi* s.n. et al. (FHI, K).

PAKISTAN. *Wallich Cat.* 7797 (BR, G, K).

SOLOMON. **Konga: Guadalcanal**, 4 June 1967, *Dennis, G.F.C.* 7337 (K); **Konga: Guadalcanal**, 1 November 1962, *Womersley, J.S.* 1002 (K).

SRI LANKA. 23 December 1975, *Bernardi, L.* 16110 (Z); *Kathriarachchi, H.S.*; *Golster* 35 (K); **Calkeda** 15 February 1980, *Maesen, L.J.G.* 4149 (K); **Minneriya: Ad templum**

Medirigiriya, 23 December 1975, *Bernardi, L.* 16110 (Z); **Sabaragamuwa: Imbulpe**, 6°42' N, 80°45' E, 16 January 2003, *Kathriarachchi, H.S.* 35 (K, PDA, WU).

SUMATRA. 1918, *Bartlett, A.W.*; *La Rue* 176 (L); 26 October 1914, *Lörzing, J.A.* 3329 (L); 21 March 1920, *Lörzing, J.A.* 7288 (L); 20 March 1928, *Lörzing, J.A.* 13012 (AMD, B, Z); 8 September 1957, *Meijer* 7232 (L); *Yates* 1868 (S); **Medan, N.** 20 March 1928, *Lörzing, J.A.* 13012 (Z); **Weigel** 20 March 1928, *Lörzing, F.A.* 13012 (P).

THAILAND. 29 September 1927, *Collins, D.J.* 1623 (K, L); 29 September 1927, *Collins, D.J.* 1623 (K); 18 October 1998, *Esser, H.J.* 173 (BKF); 17 October 1998, *Esser, H.J.* 173 (A, BKF, L); 20 October 1998, *Esser, H.J.* 193 (AAU, BKF, CMU, K); 10 March 1988, *Fischer, W.*; *Winai* 913 (FR); 29 December 1983, *Fukuoka; Ito* 35680 (A, BKF); 24 October 1994, *Garcia, L.E.* 132 (BKF); 18 September 2001, *Greijmans* 186 (CMU); 1923, *Hum, A.* 8102 (K); 6 September 1923, *Kerr, A.F.G.* 7734 (BM, K, L); 25 December 1923, *Kerr, A.F.G.* 8102 (BM, K); 30 June 1926, *Kerr, A.F.G.* 10725 (BM, K); 1926, *Kerr, A.F.G.* 10725 (K); 29 December 1927, *Kerr, A.F.G.* 13731 (BM, K); 11 December 1982, *Koyama, T.*; *Wongprasert* 30826 (A); 1 November 1993, *Larsen, Larsen, No*; 44197 (AAU); 9 August 1340, *Larsen, Smitinand; Warnecke* 1340 (BKF); July 1920, *Marcan, A.* 357 (BM); 5 August 1920, *Marcan, A.* 387 (BM, K); 6 November 1927, *Marcan, A.* 2264 (BM, K, L); 6 November 1927, *Marcan, A.* 2264 (K); 14 November 1986, *Maxwell, J.F.* 914 (A, BKF, L, PSU); 5 October 1984, *Murata, Phengkhlai*; 37587 (BKF); 1882, *Murton, H.J.* 27 (K); 11 July 1979, *Niyomdham, C.* 283 (P); 1 November 1997, *Niyomdham, C.* 5206 (BKF); 11 July 1979, *Niyomdham, C.*; 283 (K, L); 23 August 1958, *Nualmanee Satrulee* 2 (CHUL); 26 November 1976, *Phengkhlai*; 3438 (BKF); 21 August 1977, *Phengkhlai*; 3773 (BKF); 21 October 1999, *Phengkhlai*; 12028 (BKF); 23 December 1928, *Put* 2207 (BM, K, L); 23 December 1928, *Put* 2207 (K); 11 September 1931, *Put* 4206 (BM, K, L); 1 November 1931, *Put* 4254 (BM, K, L); 21 September 1999, *Puudjaa; Cholkulchana* 670 (BKF); 25 September 1981, *Sirirugsa* 476 (PSU); 11 August 1959, *Smitinand, T.* 6111 (BKF, K, L); 13 August 1965, *Smitinand, T.* 8905 (BKF); 21 October 1985, *Tongseedum* 36 (A, L, PSU); 21 November 1980, *Yingyong Paisouksantivatan* 458 (CMU); **Bua Yai: Korat**, 1 November 1931, *Put* 4254 (K); **Hua Hin** 5 August 1920, *Marcan, A.* 387 (K); **Kantuii: Surat**, 2 September 1931, *Put* 4206 (K); **Kaw Samui** 11 May 1927, *Hum, A.* 12940 (K); **Nakon Raehasima: Sikhia**, 11 August 1959, *Smitinand, T.* 6111 (K); **Pattani** 6 September 1923, *Kerr, A.F.G.* 7734 (K); **Puket** 11 July 1979, *Niyomdham, C.* 283 (K); **Sakhon Nakhon: Phu Phan**, 170389°00' N, 1035013°00' E, 20 October 1998, *Esser, H.J.* 98-193 (K); **Salut** 29 September 1927, *Kerr, A.F.G.* 13731 (K); **Siupsara** 1918, *Armaudab, S.* s.n. (K); **Tahpae: Satun**, 14 November 1986, *Maxwell, J.F.* 86-914 (P).

TOGO. 6°34' N, 1°11' E, 22 July 1971, *Breteler, F.J.* 7024 (K, WAG); 6°34' N, 1°11' E, 22 July 1971, *Breteler, F.J.* 7024 (K, WAG); **Agome** March 1900, *Schlechter, R.* 12965 (BM); **Klouto: Palimé**, 9 September 1973, *Hiepko, P.* 111 (K); **Klouto: Palimé**, 9 September 1973, *Hiepko, P.* 111 (P); **Lillikopé: Forêt classée de la Lili**, 22 July 1971, *Breteler, F.J.* 7024 (P); **Lome** 1900, *Warnecke* s.n. (P); **Lome** 1902, *Warnecke* 186 (BM); **Lome** 1900, *Warnecke* 186 (K); **Lome** , *Warnecke* 186 (BM, GOET, K, M); **Kara: Sara-kawa**, 21 October 1977, *Ern, H.* 1992 et al. (K); **Sara-Kawa: Sorghumfeld**, 21 October 1977, *Ern, H.* 1992 (P).

VIETNAM. 18 April 1971, *Hoffmann, J.R.R.* 10 (E).



Figure 5. Images of *Microstachys chamaelea*. A. Habit. B. Margin of the leaf. C. Inflorescence. (T. Siyang). D. Branch with fruits. E. Columella. (K. Han).



Figure 6. Lectotype of *Microstachys chamaelea* (J.G. Koenig, LINN!).

***Microstachys dalzielii* (Hutchinson) Esser (1998: 958)**

(Fig. 3 F-K; 4 B; 7)

≡ *Sapium dalzielii* Hutchinson (1917: 234). Type: — NIGERIA. Benué: Abinsi and vicinity Katsina Ala, 20 June 1912, *J.M. Dalziel* 749 (holotype K!, isotype E!).

Subshrub 30–60 cm tall. **Leaves** subsessile, petiole ca. 1 mm long, glabrous; blade elliptic, 1–3.5 x 0.2–0.8 cm, abaxially glabrescent, hairs 0.5 mm long, brochidodromous, 6–8 pairs of inconspicuous secondary veins or lacking, with 4 pairs of glands, ca. 0.3 mm in diameter, base attenuate, margin denticulate, plane, denticles adpressed, 0.3 mm long, apex acute; stipules ovate, 0.5 x 0.3 mm, glabrous. **Inflorescence** 2–8 cm long, axis glabrous; bracts 1 x 1 mm, 0.5 mm in diameter, apex acuminate, margin lacerate, staminate cymules numerous, pistillate cymule 1. **Staminate flower** 2–3, sessile; sepals 1 x 0.5 mm, apex acuminate; stamens 0.6 mm long, anthers 0.5 mm long. **Pistillate flower** 1, sessile; sepals 1 x 0.5 mm, apex acuminate; ovary 0.6 x 0.6 mm, smooth; stigmas rounded, 0.5 mm long, plane, glabrous. **Fruit** globose, 0.5 x 1 cm; sessile; stigmas non-persistent; appendages 0; columella persistent, ca. 5–6 mm long. **Seeds** oblong, 5 x 3 mm, testa smooth; ecarunculate.

Distribution: — This species occurs in Africa, from Ivory Coast to Nigeria. TDWG codes: 22 GHA IVO NGA TOG (Fig. 1, Table 1).

Habitat: — Sandy watershed plains often seasonally flooded.

IUCN conservation assessment: — Vulnerable (VU). This species has a large range of occurrence, but without recent collections and the population size is unknown.

Morphological notes: — *Microstachys dalzielii* is similar to *M. chamaelea*, but it differs by its leaves with acute apex, denticulate margins and sessile flowers whereas *M. chamaelea* has leaves with rounded to acuminate apex, serrulate margins and pedicellate flowers.

Additional notes: — Kruijt (1996) cited *Sapium dalzielii* (= *Microstachys dalzielii*) as a synonym under *Sebastiania faradianensis* (= *M. faradianensis*). According to Esser (1998) this synonymy is doubtful, because the type of *Sapium dalzielii* shows entire leaves whereas *Sebastiania faradianensis* has leaves with densely serrate margins. The name honors John McEwen Dalziel, a british doctor and botanist that was employed at Kew about 1923 and joined to the Allison V. Armour Expedition in West Africa (Brummitt & Powell 1992).

Additional specimens examined: — **GHANA.** 5 December 1950, *Adams, C.D.* 4157 et al. (K); 24 March 1953, *Morton, J.K.* GC 8648 (K); **Damongo Scarp**, 24 March 1953, *Morton, J.K.* 195 (GC, K); **Gold Coast N.T.**, 5 December 1950, *Adams, C.D.* 4157 et al. (K); **Lumbaga** December 1951, *Norton, J.H.* 6259 (K); **Northern Territory: Gold Coast**, 5 December 1950, *Adams, C.D.* 4157 et al. (K); **Selaga** 13 April 1964, *Hall, J.B.* VBS1254 (K).

NIGERIA. **Katsina Ala** 20 June 1912, *Dalziel, J.M.* 749 (K).



Figure 7. Holotype of *Microstachys dalzielii* (J.M. Dalziel 749, K!).

***Microstachys faradianensis* (Beille) Esser (1998: 959)**

(Fig. 8)

≡ *Excoecaria faradianensis* Beille (1910: 128) ≡ *Sapium faradianense* (Beille) Pax & Hoffmann (1912: 247) ≡ *Sebastiania faradianensis* (Beille) Kruijt (1996: 88). Lectotype (designated by Kruijt 1996): — MALI. Kayes: Faradiana, 27 March 1899, *A.J.B. Chevalier 640* (lectotype: P!; isolecto: P !).

Subshrub 10–60 cm tall. **Leaves** petiolate; petiole 1–1.5 mm long, glabrous; blade oboval to elliptic, 2–3 x 1–1.5 cm, glabrous, brochidodromous, 8–14 pairs of inconspicuous secondary veins, with 1 pair of glands, ca. 0.2 mm in diameter, base rounded, margin serrulate, plane, denticles inclined, ca. 0.5 mm long, apex rounded; stipules acute, 0.5 x 0.3 mm, glabrescent, hairs ca. 0.2 mm long. **Inflorescence** 2–3 cm long, axis glabrous; bracts 0.5 x 0.5 mm, basal glands 1.5 mm in diameter, apex acuminate, margin lacerate, staminate cymules numerous, pistillate cymule 1. **Staminate flower** pedicellate, pedicel 0.5–1 mm long; sepals 1 x 0.7 mm, apex acuminate; stamens 0.9 mm long, anthers 0.7 mm long. **Pistillate flower** 1, pedicellate, pedicel 0.5–1 mm long; sepals 1 x 1.5 mm, apex acute; ovary 1.5 x 1.5 mm, smooth; stigmas sidewardly flattened, 0.5 mm long, revolute and undivided, glabrous. **Fruit** globose, 0.9 x 0.7 cm; pedicel 0.5–1 mm long; stigmas non-persistent; 1 horn-shaped appendage on the apex of each mericarp; columella persistent, ca. 7 mm long. **Seeds** oblong, 6 x 3 mm, testa spotted; carunculate.

Distribution: — According to Govaerts *et al.* (2000), this species occurs in Africa, from Senegal to Nigeria. TDWG codes: 22 GHA GUI MLI NGA SEN.

Habitat: — Occurs along footpaths in watershed plains often seasonally flooded.

IUCN conservation assessment: — Vulnerable (VU). This species has large range, but without recent collections and the population size is unknown.

Morphological notes: — Esser (1998) described smooth fruits and leaves with serrate margins for *Microstachys faradianensis*, whereas the fruits have small appendages and serrulate leaf margins. This species is similar to *M. chamaelea* (see notes of the latter).

Additional notes: — Kruijt (1996) erroneously designated “*Chevalier 610*” as lectotype of *Microstachys faradianensis*, however the correct number is “*Chevalier 640*”. The first is the type of *Ochnella tenuis* Tieghem (1902: 122) (iso: P!). Esser (1998) combined *Sapium faradianense* under *Microstachys faradianensis*. The name honors the type locality “Faradiana” in

Mali.

Additional specimens examined: — **GUINEA.** **Djalon** 30 July 1962, *Adams, P.* 314 (K); **Diankoro** 24 May 1912, *Chevalier, A.* 29891 (P).

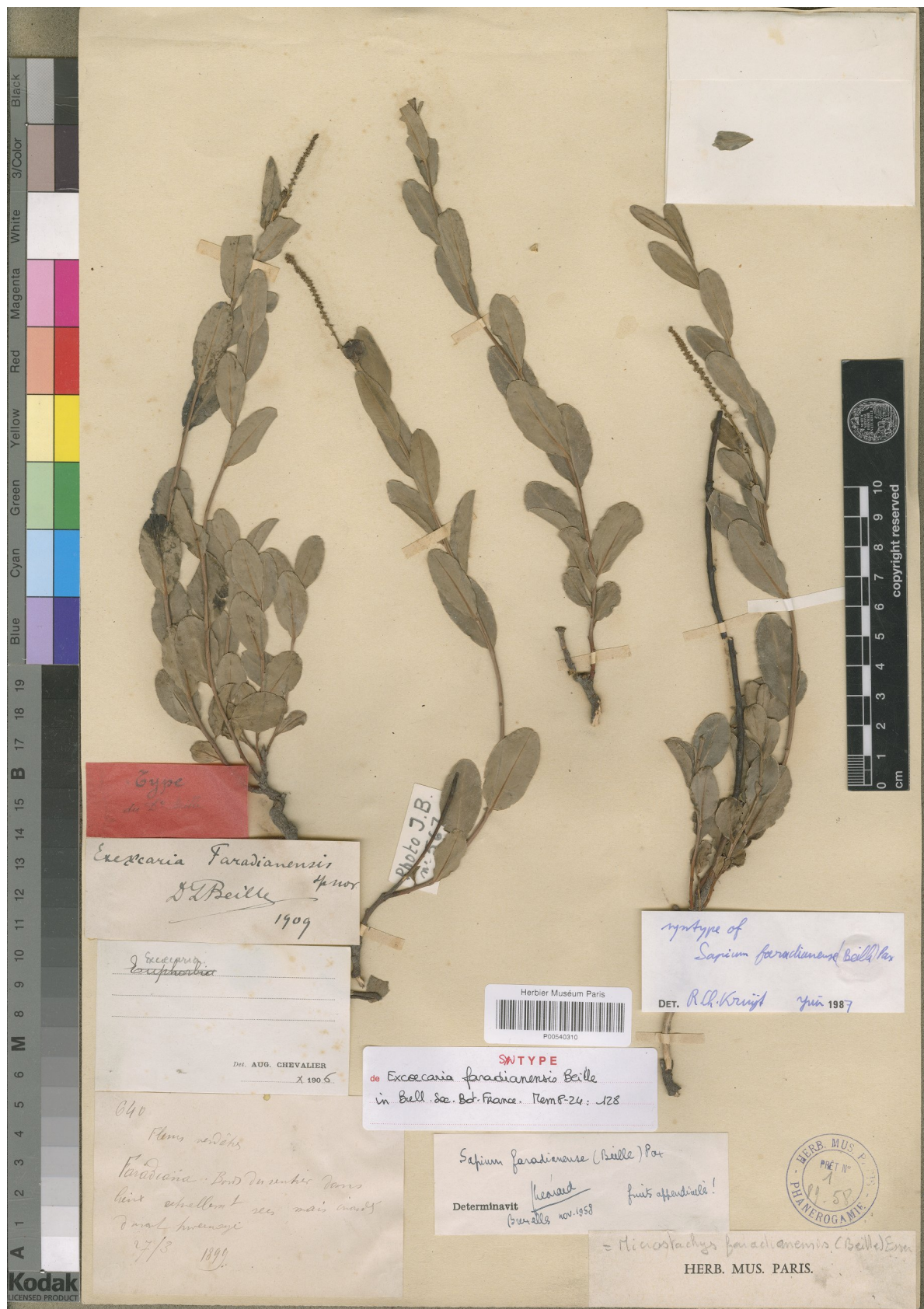


Figure 8. Isolectotype of *Microstachys faradianensis* (A.J.B Chevalier, P!).

Microstachys linearis* (J. Léonard) Pscheidt, Cordeiro & Esser, *comb. et st. nov.

(Fig. 3 L-P; 4 A; 9)

≡ *Sapium acetosella* var. *lineare* Léonard (1961: 405) ≡ *Sebastiania acetosella* var. *linearis* (J.Léonard) Lebrun & Stork (2006: 224) ≡ *Microstachys acetosella* var. *linearis* (J.Léonard) Radcl.-Sm. (in Radcliffe-Smith & Hoffmann 2007: 610). Type:—ZAMBIA. Luapula: Kawambwa, 16 November 1957, *D.B. Fanshawe 4051* (holotype K!, isotypes BR!, NDO)

Subshrub ca. 20 cm tall. **Leaves** sessile; blade linear, 0.5–3 x 0.05–0.2 cm, glabrous, hyphodromous, with 1 pair of glands, on both surfaces, ca. 0.1 mm in diameter, base attenuate, margin entire, plane, apex acuminate; stipules ovate, 0.6 x 0.3 mm, glabrous. **Inflorescence** 1.2 cm long, axis glabrous; bracts 0.8–1 x 0.8–1 mm, basal glands 0.2–0.4 mm in diameter, apex cuspidate, margin entire, staminate cymules numerous, pistillate cymule 1. **Staminate flower** 1, pedicellate, pedicel ca. 2 mm long; sepals 0.5 x 0.5 mm, apex cuspidate; stamens 0.7 mm long, anthers 0.5 mm long. **Pistillate flower** 1, pedicellate, pedicel ca. 2 mm long; sepals 1–1.5 x 0.5–1 mm, apex cuspidate; ovary 1.5 x 1.5 mm, ornate; stigmas cylindric, 1.5 mm long, plane, glabrous. **Fruit** oblong, 0.5 x 0.5 cm; pedicel ca. 2 mm long; stigmas persistent; 1 pyramidal appendage on the apex of each mericarp, ca. 0.5 mm long; columella non-persistent, ca. 6 mm long. subglobose, 4 x 3 mm, testa not spotted; carunculate.

Distribution: — *Microstachys linearis* is probably endemic to the northern Zambia. TDWG code: 26 ZAM (Fig. 1, Table 1).

Habitat: — Sandy dambos or grassland with scattered trees, ca. 1,290 m elevation (Radcliffe-Smith 1996).

IUCN conservation assessment: — Data deficient (DD). This species has a restricted range and the population size is unknown.

Morphological notes: — Radcliffe-Smith (Radcliffe-Smith & Hoffmann 2007) combined *Sebastiania acetosella* var. *linearis* (Léonard) Lebrun & Stork into *Microstachys* without additional comments. This species is clearly separated from *M. acetosella* by the morphology and we are changing the status. See the notes for *Microstachys acetosella* for additional comments.

Additional specimens examined: — ZAMBIA. **Kawambwa**, 27 November 1961, *Richards, H.M.* 15392 (K); **Ntenke: Kawambwa**, 16 November 1957, *Fanshawe, D.B.* 4051 (K).



Figure 9. Holotype of *Microstachys linearis* (D.B. Fanshawe 4051, K!).

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EXAMINED SPECIMENS

Specimens are arranged by collector (with initials, when know) in alphabetical order, followed by collector's number in increasing order (s.n. = without number), followed by species number in parentheses (*M. acetosella* = 1, *M. chamaelea* = 2, *M. dalzielii* = 3, *M. faradianensis* = 4 and *M. linearis* = 5).

- A Adams, C.D. 3977 (3), 4157 (3); Adams, L.G. 3045 (2); Adams, P. 314 (4); Adjanohoun, E.J. 206 (2), 276 (2); Andrew, M.H. 176 (2); Aplin, T.E.H. 652 (2), 5 (2), 6237 (2); Armaudab, S. s.n. (2); Audru, J. s.n. (2), 834 (2); Audry, P. A41 (2), B29 (2), B36 (2); Awa, D. S47489 (2).
- B Backer, C.A. 4578 (2), 6752 (2), 10900 (2), 20601 (2); Bacon, P.S. 212 (2); Banks, J. s.n. (2); Barter, K. 1492 (2); Beauglehole, A.C. 11256 (2), 52509 (2), 52561 (2), 52571 (2); Beddome, R.H. 7429 (2), 7430 (2); Blake, S.T. 8269 (2), 8536 (2), 9670 (2); Boiss, D. 694 (2); Bon, R.P. 629 (2), 1282 (2), 5324 (2), 5599 (2); Boudet, G. 4951 (2), 5065 (2); Bourne, A.G. s.n. (2); Brass, L.J. 99 (2), 287 (2), 1768 (2), 18403 (2), 18415 (2), 18893 (2), 18953 (2), 18954 (2), 18953 (2); Brennan, K. 2556 (2); Breteler, F.J. 7024 (2); Brooke, W.M.A. 8156 (2); Brown, R. 3556 (2), 3557 (2); Bullock, A.A. 10136 (2); Burbidge, N.T. 5861 (2); Burkill, H.M. HMB168 (2), HMB2755 (2); Byrne, G. 1403 (2), 2985 (2); Byrnes, N. 2669 (2).
- C Carr, G.W. 2606 (2), 3240 (2), 4005 (2); Carter, B.J. 96 (2), 506 (2); Charles, M. RHT51373 (2); Chatianju, B. 5935 (2); Chevalier, A.J.B. 640 (4), 2611 (4), 9055 (2), 9775 (2), 23219 (2), 23461 (2), 29891 (4); Ching, Y.P. S41153 (2); Chippendale, G. s.n. (2), 2077 (2), 7768 (2); Chun, N.K. 44795 (2); Civombe, D.E. 129 (2); Cladler, C.B. 20949 (2); Clark, M. 122 (2); Clarke, C.B. 31843 (2), 34311 (2); Clemens, J. 3006 (2); Clemens, M.S. 9756 (2); Collins, D.J. 1623 (2); Conn, B.J. 1272 (2); Coode, M.J.E. 7325 (2), 7757 (2); Coombe, D.E. 129 (2); Cooper, W. 467 (2); Corner, E.J.H. 25782 (2); Couderc, P. s.n. (2); Cranfield, R.J. 6572 (2), 6715 (2); Craven, L.A. 3842 (2), 4222 (2), 5549 (2); Cuming, H. 2324 (2), 2329 (2); Cunningham, A. 174 (2), 281 (2), s.n. (2); Curtis, C. s.n. (2).
- D Dalziel, J.M. 72 (2), 160 (2), 748 (2), 749 (3), s.n. (2); Daramola, B.O. 36934 (2); Dawkon 33 (2); Dawodu, J.B. 287 (2); Dennis, G.F.C. 7337 (2); Deschamps, M. s.n. (2); Dixon, D.J. 1494 (2); Dunlop, C.R. 2724 (2); Duthie, J.F. 9744 (2), 10558 (2).
- E Edinger, D.J. 958 (2), 1389 (2); Egan, J.L. 3572 (2), 3660 (2); Ehwaiter, M. 2132 (2); Ern, H. 1992 (2); Esser, H.-J. 98-193 (2); Evans, M. 2949 (2); Evrard, F. 171 (2), 1713 (2), 2382 (2).

- F Fabriegues, P. 2461 (2), 2653 (2); Fagg, M. 730 (2); Fanshawe, D.B. 714 (1), 4051 (5); Fitzgerald, M.V. 304 (2), 729 (2); Fonkim 17 (2); Forman, L.L. 861 (2), 1101 (2); Fotius, G. 1086 (2); Fung, H. 20308 (2).
- G Gamble, J.S. 8653 (2), 11169 (2), 13827 (2), 14595 (2), 20864 (2); Gaston, A. 1644 (2), 1893 (2); Geerling, C. 3860 (2); George, A.S. 13287 (2), 13446 (2), 14473 (2); Gillett, J.B. 15208 (2); Gironcourt 213 (2); Graham, G. 17 (2); Gressitt, J.L. 913 (2), 1161 (2); Griffith, W. 4712 (2), s.n. (2); Gronovius s.n. (2).
- H Haines, H.H. 502 (2); Hall, J.B. 3132 (2), VBS1254 (3), GC40420 (3); Hance, H.F. 1013B (2); Handasyde, T. 14 (2); Hann, W. 15 (2); Harmand, F.J. 716 (2); Hartley, T.G. 14575 (2), 14576 (2); Haviland, G.D. 3704 (2), 3709 (2), 38709K (2); Hawff 3030 (2); Henriques, 648 (1); Henry, A. s.n. (2); Hersfield s.n. (2); Hiepko, P. 111 (2); Hill, F. s.n. (2); Ho, P.H. 5820 (2); Hohenacker, R.F. 830 (2), 831 (2), s.n. (2); Horsfield, T. s.n. (2); How, F.C. 72289 (2); Hubbard, C.E. 7602 (2); Huft, M.J. 22 (2); Hum, A. 8102 (2), 12940 (2); Huvaites 2132 (2).
- I Irvine, F.R. 569 (2), 5023 (2).
- J Jackson, G. 2323 (2); Jacques-Felix, H. 8424 (2); Jarrett, F.M. HFP1072 (2); Johnson, R.W. 4929 (2); Jones, A.P.D. 5880 (2); Jones, D.L. 8967 (2).
- K Kadim 332 (2); Kanis, A. 1739 (2); Karayauaswawi, V. 63 (2); Kathriarachchi, H.S. 35 (2); Keighery, G.J. 121 (2), 1364 (2); Kellick, H.J. 254 (2); Kenneally, K.F. 5299 (2), 5922 (2), 6119 (2), 7635 (2), 8306 (2), 9928 (2), 9976 (2); Kerr, A.F.G. 1134 (2), 2207 (2), 4206 (2), 4254 (2), 7734 (2), 8102 (2), 10725 (2), 13731 (2); Kerr, F.H.W. 2270 (2); Kiah, S. S97 (2); Killick, H.J. 254 (2); Koch, B.L. 628 (2); Kostermans, A.J.G.H. 25362 (2); Kurz, W.S. 9 (2).
- L Langfield, E.C.B. 166 (2), 256 (2), 265 (2); Latz, P.K. 2844 (2), 3988 (2), 13126 (2), 13895 (2); Lau, S.K. 483 (2), 1148 (2), 3180 (2), 3564 (2); Lawson, M.A. 110 (2); Lazarides, M. 5074 (2), 7814 (2), 7890 (2), 9182 (2); Leach, G.J. 3520 (2); Legge, S. 467 (2); Lei, C.I. 3 (2), 929 (2); Lemarie, M. s.n. (2); Liang, H.Y. 62832 (2); Lovi, N. 3941 (2); Lowe, J. 2252 (2); Lörzing, J.A. 13012 (2).
- M Mackenzie, D.H. 690302-22 (2), 690312-10 (2); Maconochie, J.R. 1473 (2), 2586 (2); Madani, L. 111373 (2); Maesen, L.J.G. 4149 (2); Maingay, A.C. 2983 (2); Marcan, A. 357 (2), 387 (2), 2264 (2); Marchal, A. s.n. (2); Martensz, P. 601 (2); Maxwell, J.F. 86-914 (2); McClure, F.A. CCC7569 (2), s.n. (2); McKee, H.S. 8551 (2); McKenna, S.G. 942 (2); Meikle, R.D. 683 (2); Michell, C.R. 501 (2); Milne-Redhead, E. 1105 (1), 2773 (1), 3963 (1), 4115 (1); Mitchell, A.A. 2071 (2), 3527 (2), 6182 (2); Mitchell, A.S. 349 (2); Mooney, H.F.

- 1591 (2), 1641 (2), 2168 (2); Mueller, F. s.n. (2); Murton, H.J. 27 (2); Muspratt, J. 154 (2); Mutimushi, J.M. 477 (5).
- N McClure, F.A. CCC7569 (2); Niyomdham, C. 283 (2); Norton, J.H. A2294 (2), s.n. (2); Norton, J.K. 6259 (3), GC8648 (3); Nur, M. 29744 (2).
- O Okafor, J.C. s.n. (2); Olorunfemi, B.B. s.n. (2); Orchard, A.E. 4719 (2); Orr, T.M. 353 (2).
- P Paijmans, K. 2388 (2), 2425 (2); Palayer 429 (2); Paramasivan, G. RHT24182 (2); Pausins, A.C. s.n. (2); Pen, L.J. 60 (2); Perry, R.A. 1476 (2), 1926 (2), Petelot, M. s.n. (2); Pethersom, R.J. s.n. (2); Pierre, L. s.n. (2); Ping, M. 9065 (2); Platiel 96 (2); Poisson, E. 131 (2); Pullen, R. 9220 (2); Purdie, R.W. 3254 (2), 3255 (2); Purselove, J.W. P4613 (2); Put, N. 2207 (2), 4206 (2), 4254 (2).
- R Randall, D.J. 757 (2); Rankin, M.O. 1542 (2), 2171 (2); Rao, R. 1226 (2); Reeve, H. 581 (2); Rice, B.L. 2152 (2), 2153 (2), 2310 (2); Richards, H.M. 15392 (5); Ridley, H.N. 2334 (2), 14518 (2), 14940 (2); Ripley, S. 361 (2); Rippstein, G. 2307 (2); Royce, R.D. 1945 (2); Russell-Smith, J. 5149 (2).
- S Sanso s.n. (2); Schlechter, R. 12905 (2), 12965 (2), s.n. (2); Sekultz, F. 539 (2); Shah, M. MS973 (2); Simpson, N.D. 8307 (2); Sinclair, J. 10575 (2), 38363 (2); Slee, A.V. 2766 (2); Smith, C. 106 (2); Smith, L.S. 11019 (2); Smith, N.M. 3681 (2); Smitinand, T. 6111 (2); Spare, G.H. 34564 (2); Specht, R.L. 207 (2), 1296 (2); Staples, I.B. 2189 (2); Sundaling, D. 55982 (2); Suriikoe, R. s.n. (2).
- T Talbot, P.A. s.n. (2); Tate, G.R. s.n. (2); Telford, I.R. 8023 (2), 8096 (2); Teo, L.E. 483 (2); Teysmann, J.E. s.n. (2); Thomas, N.W. 711 (2), 1064 (2), 1380 (2); Thomson, G. s.n. (2); Thorel 1475 (2); Tsang, W.T. 339 (2), 519 (2).
- V Vernon, L. 21 (2); Vogel 51 (2), s.n. (2).
- W Wacri, N.K.L. 3941 (2); Waddler s.n. (2); Wallich, N. 7797 (2); Ward, F.K. s.n. (2); Warnecke, O. 181 (2), 186 (2), s.n. (2); Weston, A.S. 12403 (2); Wight 264 (2), 2643 (2); Wightman, G. 1848 (2); Willing, T. 143 (2); Wilson, I.B. 62 (2), 283 (2); Wilson, P.G. 10818 (2), 10914 (2), 11189 (2), 11463 (2), 12919 (2), 12822 (2); Wit, G. 442 (2); Womersley, J.S. 1002 (2).
- Y Yaph, R.H. s.n. (2); Young, A.P. s.n. (2).

CAPÍTULO 3

A ser submetido à revista *PloS One* (normas em Anexo 2).

**Molecular phylogeny of *Microstachys* (Euphorbiaceae, Hippomaneae)
and allied taxa inferred from nrDNA and cpDNA markers**

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Abstract

Microstachys is a hippomanean genus in the family Euphorbiaceae distributed along tropical regions throughout the world, but with great diversity in the neotropics, especially in Brazil. Although morphologically distinct from other hippomanean genera, its relationships within Hippomaneae are still unclear. Also, many *Microstachys* species have been treated within *Sebastiania*, *Stillingia* and *Tragia* and/or have unclear circumscriptions. Phylogenetic relationships within *Microstachys* as well as its relationships to related genera were evaluated using nrDNA (ITS) and cpDNA (*trnL-trnF*, *rps16-trnQ*, *ycf3-trnS*) and a diversification analysis was carried out using BEAST v.1.8.0. Our results support the monophyly of *Microstachys* with two neotropical clades within it (N1 and N2), apparently without morphological synapomorphies. Within N1 (19.2 mya) species are morphologically more homogenous and show a wider distribution (except for *M. ulenana* and *M. revolute*), while on N2 (9.18 mya) species are morphologically very heterogeneous and endemic or restrictedly distributed. Diversification within neotropical *Microstachys* seems to have occurred over the past 15 mya when open formations, such as savannas, expanded throughout the world. The wider distribution pattern observed in some species seems to have been reached in recent times due to retraction of forest environments in the Amazonia during the Tertiary and the origin of seashore plains during the Pliocene-Pleistocene. Relationships with other hippomanean genera are still unclear, perhaps due to low sampling and complicated circumscription of its species.

Keywords: Euphorbiaceae, Hippomaneae, *Sebastiania*, diversification

INTRODUCTION

Microstachys A.Juss. is a hippomanean genus of Euphorbiaceae. The most recent circumscription of *Microstachys* comprises 24 species, 19 for the Neotropics, four for the Paleotropics and one from the Paleotropics to Australian regions. Different authors have treated *Microstachys* as a section of *Sebastiania* [1, 2, 3, 4]. Both genera have spiciform bisexual inflorescences, with flowers solitary or in clusters of two or three, staminate flowers at distal nodes and pistillate flowers at the base of axis, both subtended by biglandular bracts, calyx trilobed, petals and disc absent, stamens 3, filaments free or basally connate, ovary tricarpetate, with three entire styles [5]. However, *Microstachys* has several unique characters within Hippomaneae such as herbaceous or subshrubby habit, leaf margin with very small and dense glandular teeth, if not entire, usually leaf-opposed inflorescences, ovary and fruit with rows of spiny appendages and seeds often with a stipitate disc-shaped caruncle [5, 6].

Many species of *Microstachys* were originally described in other genera of Euphorbiaceae as *Tragia* and *Stillingia*, and also combined into *Sebastiania* [7, 8]. This situation results in the dubious circumscription of genera within Hippomaneae. Esser [6, 9] and Esser & al. [10] believe, based on morphology, that the genus *Microstachys*, separated from *Sebastiania* s.l., is monophyletic and clearly separated from all other genera of the tribe Hippomaneae.

Recent investigations on Euphorbiaceae have addressed the relationships of major clades within the family using molecular and morphological data [11, 12, 13]. *Microstachys* has never been widely studied in phylogenetic analyzes of the family. Wurdack & al. [12] used *M. corniculata* (Vahl.) Griseb. for *rbcL* and *trnL-trnF* analyzes; Horn & al. [14] used *M. chamaelea* (L.) Müll.Arg. as outgroup for ITS, *ndhF*, *rbcL*, *rbcL-accD*, *rpl16*, *trnL-F*, *nad1B-C*, *rps3* and *EMB2765* analyzes of the genus *Euphorbia* L.

With other hippomanean genera, Wurdack & al. [12] showed that the tribe comprises, with Hureae and Pachystromateae, a clade in Euphorbioideae–Euphorbiaceae. There were some unexpected results concerning the circumscription of these tribes as compared to traditional treatments based on morphological data [5]. For

example, Hippomaneae comprises two separate clades, and Hureae and Pachystromateae emerged amid Hippomaneae. Wurdack & *al.* [12] sampled extra Brazilian species of Hippomaneae, Hureae and Pachystromatae. Many of these genera have Brazil as center of diversity, with some endemic species, like *Microstachys*.

The present study aims to obtain phylogenetic hypotheses of relationships of *Microstachys* and allied taxa based on nuclear and plastid DNA markers to discuss its relationships with *Gymnanthes*, *Mabea* and *Sebastiania*, as well some insights on its geographic history, distribution and diversification.

MATERIALS AND METHODS

Plant material. – Fourteen of the 24 species here accepted in *Microstachys* were sampled, as well as two species from each of the hippomanean *Gymnanthes*, *Mabea* and *Sebastiania*, which were included as outgroup following previous results of phylogenetic studies of Euphorbiaceae [12]. All sequences are deposited in GenBank and species names, vouchers, and GenBank accession numbers are given in the Appendix 1.

DNA extraction, amplification, cloning and sequencing. – Leaf material used in the molecular analyzes was collected in the field and dried in silica gel[15]. The material sampled from herbarium specimens did not generate good sequences. For extraction of fresh material the lamina was cut avoiding damages in the central vein preventing latex contamination. Total genomic DNA was extracted from the material using Invisorb Plant Midi Kit (Invitek, Germany). At first the CTAB protocol [16] was used, but without success. For *Microstachys* the kit showed more efficiency than the CTAB protocol. The tissue was grinded using Precellys bead-based homogenizer (PEQLAB Biotechnology, Germany).

One nrDNA region – the internal transcribed spacer (ITS) – and tree cpDNA regions – the intergenic spacer *rps16-trnQ*; the *trnL-trnF* intergenic spacer of the *trnL-trnF* non-coding region; and the non-coding *ycf3-trnS* region – were amplified using the

universal primers as indicated in Table 1. Polymerase chain reactions (PCR) were performed in 25µL volumes composed of 12,5µL of GoTaq Colorless Master Mix (Promega, USA), 6µL of ddH₂O, 6µL of trehalose-based additive[21], 2 µL of each primer direction (from Macrogen, Korea) and 2 µL of template DNA. The PCR conditions varied for each DNA region and consisted of an initial 2 min to 4 min denaturing step at 94-95°C; followed by 35 to 45 cycles of the following steps: 30 s to 1 min denaturation at 94°C to 95°C, 30 s to 1 min 30 s annealing at 42°C to 62°C and 1 min to 2 min extension at 65°C to 72°C. A final extension phase of 4 to 7 min at 72°C was conducted.

Table 1. Primers description used in this study.

Region	Primer	Sequences	Reference
ITS	ITS1	5'-GTCCACTGAACCTTATCATTTAG-3'	[17].
	ITS2	5'-GCTGCGTTCTTCATCGATGC-3'	
trnL-F	trnL-c	5'-CGAAATCGGTAGACGCTACG-3'	[18].
	trnL-d	5'-GGGGATAGAGGGACTTGAAC-3'	
trnQ- rpS16	trnQ	5'-GCGTGGCCAAGYGGTAAGGC-3'	[19].
	rpS16x1	5'-GTTGCTTTYTACCACATCGTTT-3'	
ycf3-trnS	SP43122F	5'-ATTGGCYACAAYTGAAAAGG-3'	[20].
	SP44097R	5'-ATTCGAACCCTCGGTAAACA-3'	

The resulting PCR products were run on a 2% agarose gel stained with ethidium bromide and gel red and visualized on a UV trans-illuminator. The PCR products were then cleaned of excess primers and dNTP using Purelink PCR Purification Kit (Invitrogen, Life Technologies, USA). Purified PCR products were sequenced at Genomic Engenharia Molecular (São Paulo, Brazil) using 5 µL of purified PCR sample (with a minimum of 20 ng concentration) and 3.2 pmol primer diluted in ddH₂O for each sample. The sequencing reactions used BigDye Terminator v3.1 Cycle Sequencing Kit (Applied Biosystems, U.K) and the cycle-sequencing products were resolved by capillarity electrophoresis using 3130 xl Genetic Analyzer (Applied Biosystems, UK).

Alignment and phylogenetic analyzes. – Sequences were edited visually with Genious v.6.1.7[22] and aligned by MUSCLE[23] and refined by hand using similarity criteria. The molecular data were analyzed using Bayesian, Maximum Likelihood and Maximum Parsimony analyzes. Each individual marker was analyzed separately, as well as a combined nuclear and plastid total dataset, using both parsimony and model-based approaches.

The Bayesian inferences (Bi) were performed with MrBayes v.3.1.2 [24]. In order to determine the optimal model of DNA evolution for the data we used Modeltest v.3.7[25] with the Akaike Information Criterion [26]. For the Bayesian analyzes we ran 1 million generation sampling every 10.000 generations.

The Maximum Parsimony (MP) analyzes were performed with PAUP v.4.0b.10 [27]. For each MP analyzes, all characters were equally weighted. The most parsimonious trees were obtained with heuristic search of 1.000 replicates with random stepwise sequence addition, tree bisection-reconnection (TBR) branch swapping, collapse of zero-length branches, with the multiple-tree option in effect, and saving up to 10.000 trees from each random sequence addition. Majority-rule and strict-consensus trees were calculated from the trees saved. Bootstrap support values [28, 29] were compared to check for strongly supported, conflicting clades among the separate analyzes of each separate gene region.

The ILD test was used to estimate the incongruence length using parsimony optimality criterion in PAUP with 1.000 replicates, heuristic search, with simple addition of taxa, TBR, and the multrees option in effect and saving 10 trees per replicate.

Diversification analyzes was carried out using BEAST v.1.8.0 [30] based on a Bayesian approach to estimate the phylogenetic relationships of *Microstachys*. Mutation rates and nucleotide variation over time were treated using lognormal model of the uncorrelated relaxed molecular clock. The evolutionary GTR+I model was selected by the Akaike Information Criterion in jModelTest[31]. The analyzes was calibrated using *Hippomaneioidea warmanensis* fossil[32], with estimated age of 44.95 mya. A lognormal distribution with standard deviation equal to 0.75 was used to assume fossil's estimated age as minimum age of the origin of the clade and to assume decreasing probabilities for older ages. Phylogenetic reconstructions and divergence time were

estimated with Markov Chain Monte Carlo (MCMC) in four independent runs with 30 million generations each, sampled every 1.000 generations. Tracer v.1.5 [33] was used to evaluate the convergence and stationarity of the chains and the parameters sampling sufficiency ($ESS \geq 200$). Data from four independent chains were combined with LogCombiner v.1.6.2 [30] after removal of 25% of the parameters in the non-stationary phase (burn-in). The final consensus tree with posterior probabilities and divergence time between the lineages was edited with FigTree [30].

RESULTS

For all species sampled we obtained satisfactory sequences for ITS, trnL-F, trnQ-rpS16 and ycf3-trnS (Table 1). However we tested another seven DNA marks following recent works with the family Euphorbiaceae without success: EMB2765 exon 9 [13], ETS [34], psbA-trnH [35, 36], rpL32-trnL [19], trnG [37], trnK-matK [38]. Statistics, including informative characters, for each molecular markers and combined analyzes are given in Table 2. The ILD test showed incongruence ($p=0.001$) for all molecular partitions combined into two datasets: cpDNA and ITS+cpDNA.

Table 2. Main characteristics of each DNA region used in the phylogenetic analyzes.

	ITS	trnL- trnF	ycf3- trnS	rps16- trnQ	Combined cpDNA	Combined ITS+cpDNA
Number accessions	20	20	20	18	20	20
Alingment lenght [bp]	352	663	643	933	2239	2591
Number of parsimony- informative characters	130	37	236	88	361	491
Variable characters	38	162	27	81	270	308
Constant characters	184	464	380	764	1608	1792
Number of MP trees	1	16	20	184	79	17
MP Tree length	315	221	307	219	807	1212
Consistency index, only	0.73	0.80	0.92	0.84	0.77	0.69

informative characters

Retention index	0.86	0.89	0.97	0.88	0.87	0.81
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Nuclear ITS data. – MP (Fig. 1) and BA (Fig. 2) analyzes of the ITS dataset resolve *Microstachys* as paraphyletic by the placement of *M. chamaelea* with species of *Sebastiania*. This could be an artifact of taxon sampling. The clade comprising the neotropical species of *Microstachys* is monophyletic (BS 100%) and divided into two subclades: N1 (64.9-73% BS) and N2 (100% BS). Just in the parsimony analyzes the relationships within N1 are resolved, and within N2 only the basal placement of *M. nummularifolia* and the sister relationship between *M. marginata* and *M. heterodoxa* are resolved. *Sebastiania* + *M. chamaelea* emerges as sister group to the neotropical *Microstachys* in both analyzes, and the relationships with *Gymnanthes* and *Mabea* is not clear due the low sampling of these genera.

Individual plastid regions. – In the MP (Fig. 1) and BA (Fig. 2) analyzes of the *trnL-trnF* dataset the genus *Microstachys* is supported as monophyletic with *M. chamaelea* (BS 76%) and with the neotropical clades recovered. In the outgroup, MP analyzes produced a clade of *Sebastiania* (BS 99%) sister to *Gymnanthes klotzschiana* (BS 76.8%) but other relationships regarding *G. schottiana* and *Mabea* remained unclear.

MP (Fig. 1) and BA (Fig. 2) analyzes of the *ycf3-trnS* also supported the monophyly of *Microstachys* (97.4-100% BS), as in the *trnL-trnF* analyzes. *Microstachys chamaelea* emerges as sister to the neotropical clade. Although relationships within N1 and N2 are unclear, and they emerged separated on BA analyzes, on MP analyzes species from N2 emerged in a polythomy with the N1 clade. On both analyzes, *Sebastiania brasiliensis* emerged as sister to *Microstachys*, but *S. brevifolia* emerged in a clade containing *S. brevifolia* + (*Gymnanthes* + *Mabea piriri*) with 100% BS support.

As *Microstachys chamaelea* was not available for MP (Fig. 1) and BA (Fig. 2) analyzes of the *rps16-trnQ* dataset, no information about its relationships with others *Microstachys* are presented. The MP analyzes could not recover N2 clade, and the same relationships within N1 are recovered in both analyzes.

Combined analyzes. – Despite the incongruence of the ILD test the combined

analyses produced a similar result with the individuals analyses. The MP (Fig. 1) and BA (Fig. 2) analyses of the combined nrDNA + cpDNA dataset show *Microstachys* as monophyletic (BS 100%), with *M. chamaelea* as sister group of the neotropical species and this divided into two clades, with better resolution within N1 clade. The genus *Sebastiania* emerged as a resolved (84.8-100% BS) sister group to *Microstachys* and this clade sister to another one containing *Gymnanthes* + *Mabea piriri* (BS 100%).

The MP (Fig. 1) and BA (Fig. 2) analyses of the combined cpDNA dataset produced a similar result, with *Microstachys* as monophyletic (BS 99%) with *Sebastiania brasiliensis* as sister group. On both analyses, *Sebastiania brasiliensis* emerged as sister to *Microstachys*, but *S. brevifolia* emerged in a clade containing *S. brevifolia* + (*Gymnanthes* + *Mabea piriri*) with 100% BS support.

Diversification analyses. – The analyses was based on the ITS dataset because this dataset was the only one with ESS $\geq$ 200. The tree (Fig. 3) shows the origin of *Microstachys* about 50.4 mya divided in two events of diversification process: the first with the ancestor of the clade comprising *M. chamaelea* and *Sebastiania* about 35.1 mya, and the second with the diversification of the genus *Microstachys* in the neotropics about 19 mya.

Within the neotropical clade, *Microstachys* evolved in two lineages. The first lineage (N1, 19.2 mya) includes the ancestor of the clade comprising *M. glandulosa*, *M. bidentata*, *M. salicifolia*, *M. daphnoides*, *M. hispida*, *M. corniculata*, *M. uleana* and *M. revoluta*. The other lineage (N2, 9.18 mya) includes the ancestor of *M. nummularifolia* and other species sisters to it: *M. nana*, *M. ditassoides*, *M. marginata* and *M. heterodoxa*.

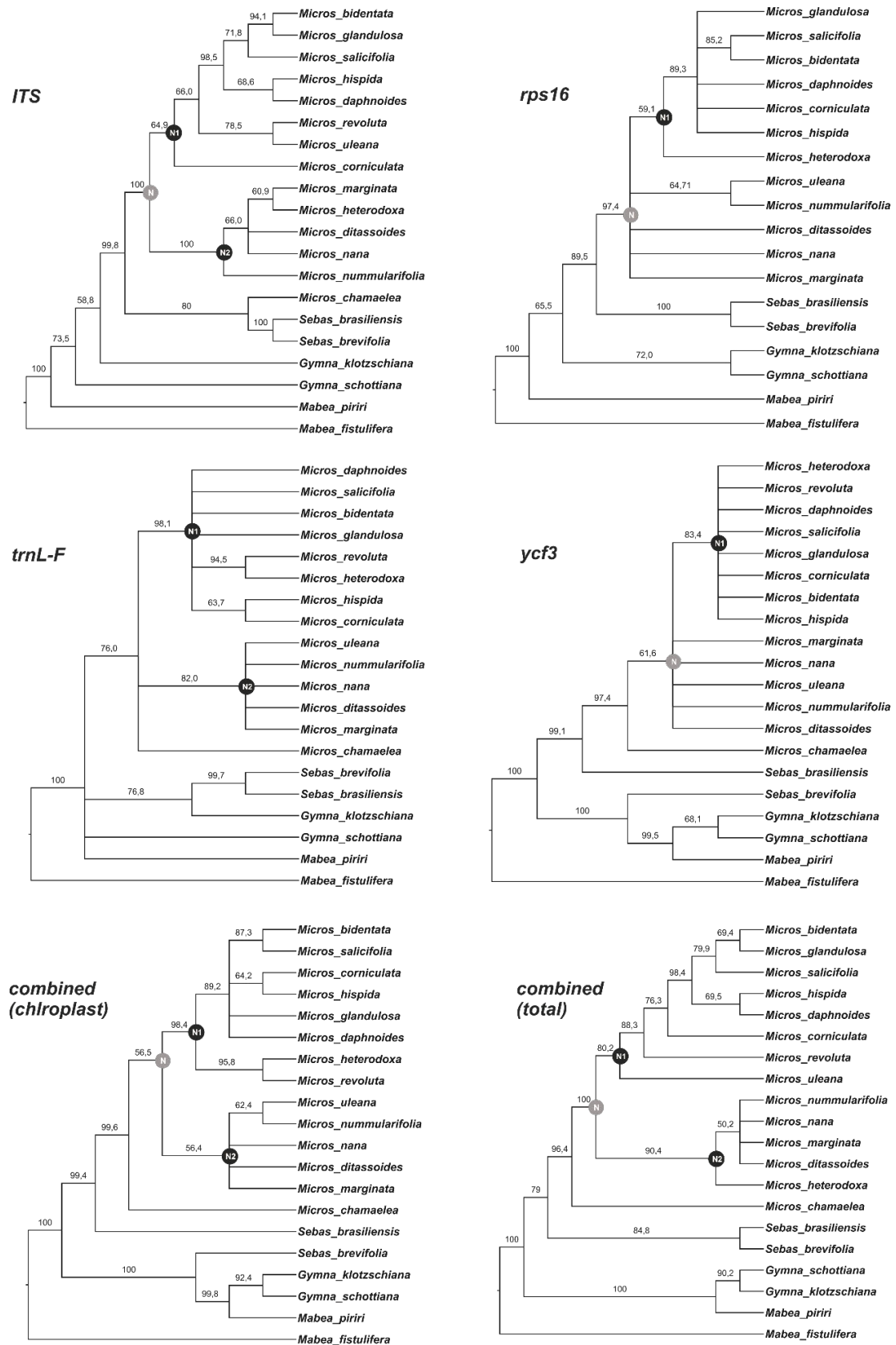


Figure 1. Most parsimonious trees of each dataset. Numbers above branches are bootstrap support (BS).

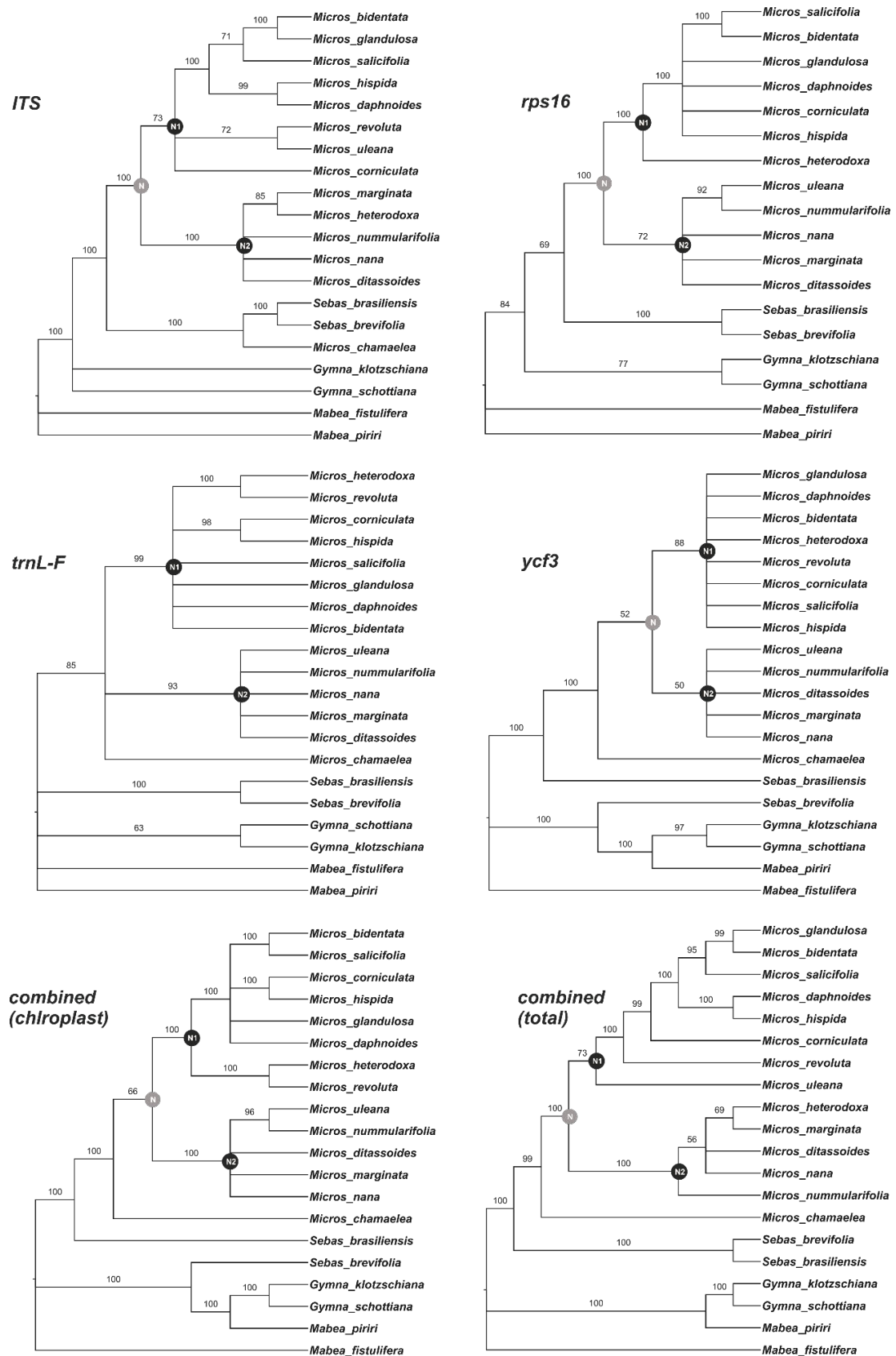


Figure 2. Phylogenetic hypothesis based on Bayesian analyzes of each dataset. Numbers above branches are posterior probabilities (PP).

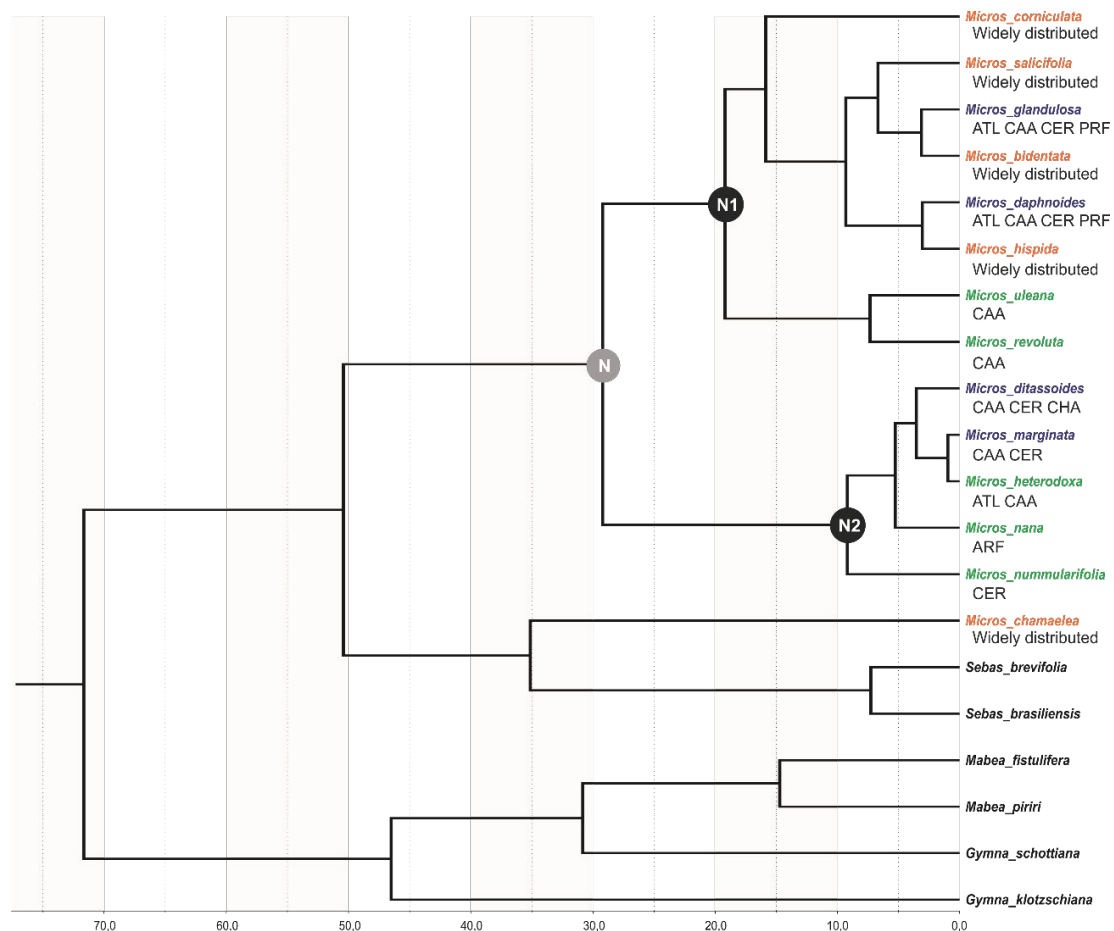


Figure 3. Chronogram with time scale generated from nrDNA (ITS) dataset (*Micros* = *Microstachys*, *Sebas* = *Sebastiania*, *Gymna* = *Gymnanthes*; N = Neotropical clade, N1 = Neotropical clade 1, N2 = Neotropical clade 2; Orange color = Species widely distributed, Blue color = Species with restricted distribution, Green color = Endemic species; acronyms of Morrone's 2014 provinces: ATL = Atlantic, ARF = *Araucaria* Forest, CAA = Caatinga, CER = Cerrado, CHA = Chacoan, PRF = Parana Forest).

DISCUSSION

Phylogenetic relationship among *Microstachys* and allied genera. – Among the species sampled for the phylogenetic analyzes, there is a predominance of neotropical species, with only one paleotropical species. This is due to problems in the amplification of sequences from other paleotropical species, which were not appropriate

for the phylogenetic analyzes. Because of this, here we only discuss the biogeographical aspects from neotropical species of *Microstachys*.

The incongruence of the datasets studied in this work prevents a more robust analyzes, although trees from both combined analyzes are similar with the other trees. *Microstachys* is monophyletic with *Sebastiania* as sister group, as expected gives te morphological similarities and the traditional relationship indicated in studies of both genera. The neotropical species of *Microstachys* are unambiguously divided into two clades (Fig. 4). No synapomorphies for N1 and N2 clades could be found. However, within N1 clade, species are morphologically more homogeneous and show a wider distribution pattern (except for *Microstachys uleana* and *M. revoluta*), while N2 species are morphologically very heterogeneous and are endemics or are restrictedly distributed.

The strange position of *Sebastiania brevifolia* in some analyzes (ITS, *ycf3-trnS* and combined cpDNA) was probably due to the low sampling of this genus, and its complicated circumscription and relationship with non-sampled *Excoecaria* (an Asian genus with very similar morphology) and *Gymnanthes*.

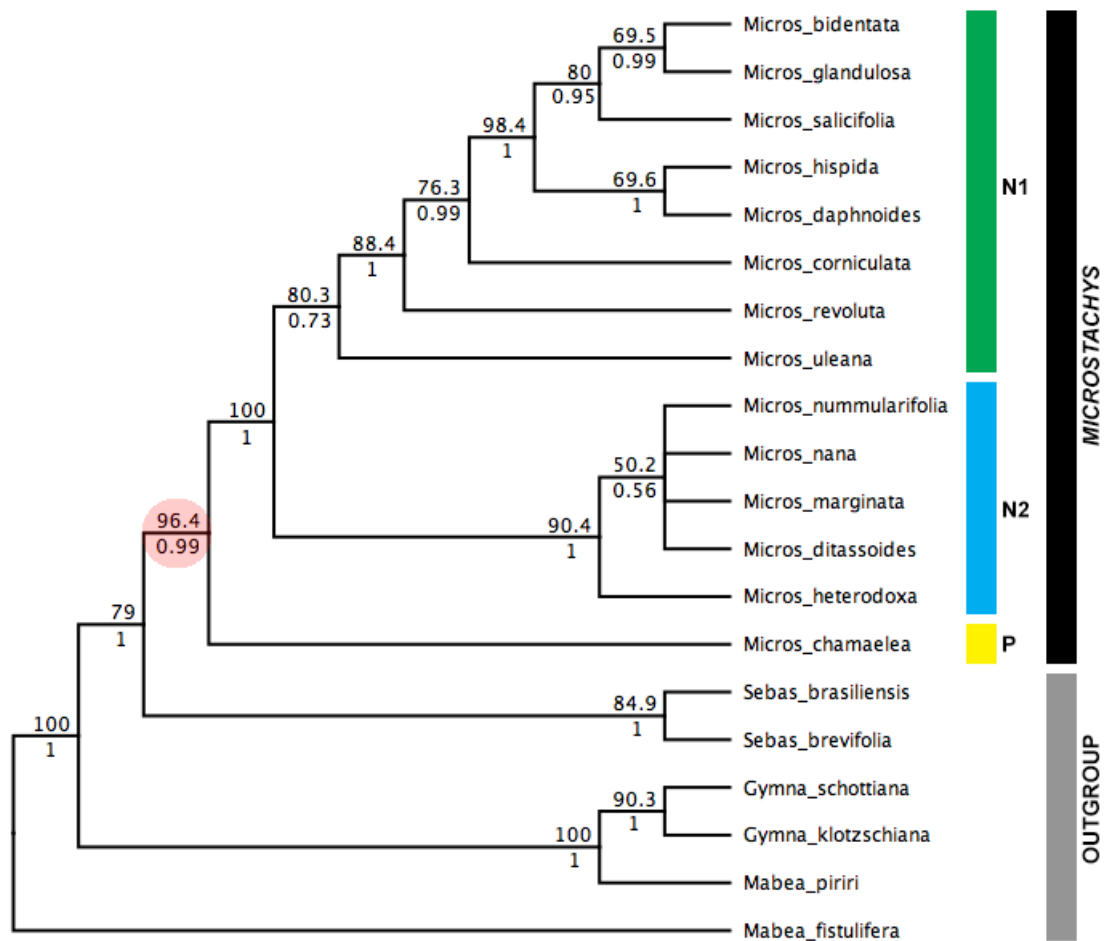


Figure 4. Strict consensus tree from the nrDNA (ITS) and cpDNA (trnL-trnF + ycf3-trnS + rps16-trnQ) dataset. Numbers above branches are bootstrap support (BS) values and numbers below the branches are Bayesian posterior probabilities (PP).

Geographic patterns, biogeographical history and diversification of *Microstachys* in South America

Microstachys occurs disjunctly along all regions of the Holotropical reign: Neotropical, Afrotropical, Oriental and Tropical Australian. However, it reaches its greatest diversity in the Neotropical region, with 19 species, followed by the Afrotropical region, with five species. In the Oriental and Tropical Australian regions, only *M. chamaelea* occurs, which is the species with widest distribution, also found in the Afrotropical region.

In the Paleotropical region, *Microstachys* species (Table 3) are concentrated in the Sudan-Zambezian region, both on the south and northwestern portions, where it grows on savannah and swampy fields. In the northwestern portion of Africa, they occur between the Saharo-Arabian region, with an extremely dry weather, and Guineo-Congolian region, with a humid weather due to the African humid forest formations. *M. chamaelea* is also present in savannahs from the northwestern portion of the Sudan-Zambezian region, extending its range to the Australian reign. This species occurs on seashore formation from Asia, in Indian, Indochines and Malesian regions, and Australia, in the Northeast Australian region [39].

Considering Morrone's biogeographical classification[40] for the Neotropical region, the genus is represented almost in all its subregions (Antillean, Brazilian and Chacoan) and in the South American transition zone and it is absent only from the Mexican transition zone (Fig. 5, Table 4). Its setentrional limit is South Mexico, in the Pacific Lowlands province, near the limits of the Holarctic reign, while the meridional one is near the limits with the Holoantartic reign, at the east of Rondonia province, near to the Yungas province.

Three species are widely distributed (*Microstachys bidentata*, *M. corniculata*, and *M. salicifolia*), seven are restricted (*M. crotonoides*, *M. daphnoides*, *M. ditassoides*, *M. glandulosa*, *M. hispida*, *M. marginata* and *M. serrulata*) and nine are endemic (*M. anisodonta*, *M. dasycarpa*, *M. heterodoxa*, *M. liliputiana*, *M. nana*, *M. nummularifolia*, *M. revolute*, *M. stipulaceae*, *M. uleana*). Widely distributed species are found almost all over open vegetation in South America and only one, *M. corniculata*, reaches Central America and Mexico. These species are the only ones that occurs on Amazonia, where the genus is limited to peripheral portions, on fieldy formations along the forest ones. This peripheral distribution has already been described for other genera of vascular plants as the peri-amazonian pattern [41].

On the Chacoan subregion *Microstachys* reaches its greatest species diversity, with a greater concentration of records for restricted species and all the records for endemic species. Restricted species are found in Atlantic Forest, Caatinga, Cerrado Chacoan, Parana Forest and Pampean provinces, in Chachoan and Parana dominion.

Among the endemic species, three occur on distinct provinces from the others (Araucaria Forest, Chacoan and Pampean), other three occur exclusively in Cerrado province, and two exclusively in Caatinga province. One species, *M. heterodoxa*, shows a disjunct distribution in *campos rupestres* and seashore plains (*restingas*) in Caatinga

and Atlantic Forest provinces, respectively, a pattern which has already been noticed on several groups of vascular plants [42].

Based on the dated phylogenetic hypothesis (Fig. 3), it is possible to affirm that plants with characteristic similar to those observed on actual Hippomaneae genera should already existed since Later Cretaceous, ca. 70 mya. As other hypothesis presented here, this one includes most of neotropical *Microstachys* species, as well other neotropical species from other Hippomaneae genera, and only one extra-neotropical *Microstachys*, what makes it impossible to provide reliable inferences about *Microstachys* age. However, it is possible to observe that in South America *Microstachys* diversification seem to be occurred over the past 15 mya, when savannahs and other open formations expanded throughout the world with gradually dry weather and increased CO² concentration on atmosphere during the Miocene. This coincides with diversification of Poaceae C4, Agavaceae and Cactaceae [43].

Hippomaneae genera related to *Microstachys*, as *Sebastiania*, *Gymnanthes* and *Mabea* are arboreal and predominantly forest phanerophytes, while *Microstachys* species show morphological traits that are more adapted to open environments as criptophyte life form and subshrubby to shrubby habit. These traits allow plants to survive to prolonged dry periods or even to fire. Recent evidences have demonstrated that several Cerrado plants lineages have this diversification pattern as in *Andira* and *Mimosa* – Fabaceae and Microlicaceae – Meltastomataceae [44], as well other *campo rupestre* lineages as *Lychnophora* and *Eremanthus* – Asteraceae [45] and *Chamaecrista* – Fabaceae [47].

Colonization of areas within Amazonia, where forests exist since Paleocene, was possible due to climate changes during the Tertiary, when the weather became drier. With forest retraction during this time, islands of savannah vegetation emerged, where currently *Microstachys* species are found, specially those widely distributed.

Although three species (*Microstachys bidentata*, *M. corniculata* and *M. salicifolia*) are widely distributed through South America, only one of them, *M. corniculata*, extends its range to Central America, until the south of Mexico and Antilles. This distribution, however, probably have been achieved by migration through islands that already existed by that time, once Panama isthmus [47] was formed only 10 mya.

Seashore plains (*restingas*) occupation, which consists of sedimentary fields of Pliocene-Pleistocene origin [48], observed on *Microstachys corniculata*, must be more recent, by gradual migration [49].

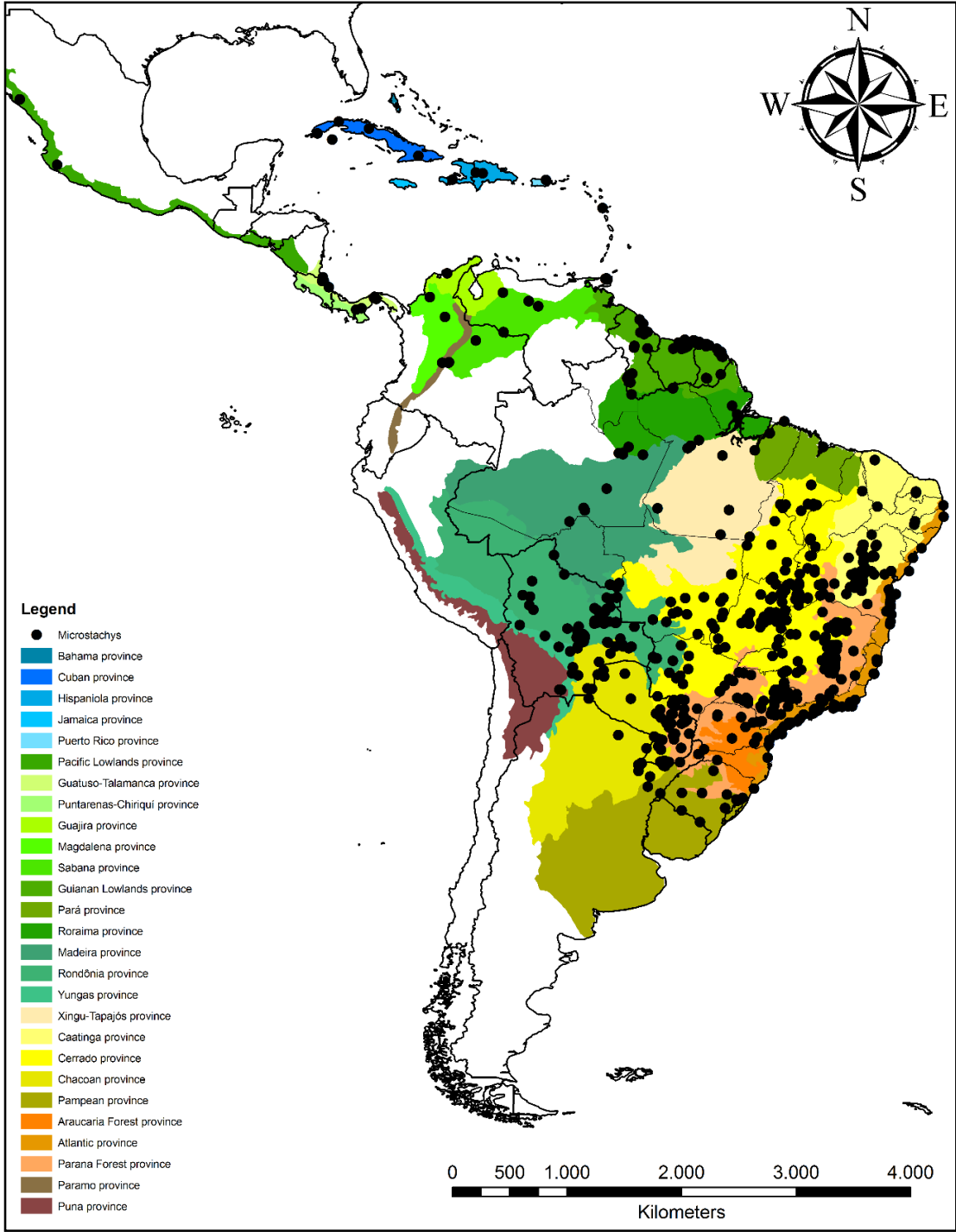


Figure 5. Distribution of *Microstachys* in Neotropics.

Table 3. Distribution of extra-neotropical species of *Microstachys*. Phytogeographical regions according to Takhtajan 1986.

Distribution	Species	Occurrence Area	Phytogeographic Regions	Habitat
1. Wide	<i>M. chamaelea</i>	Australia, Benin, Cambodia, Cameroon, Central African Republic, China, Ghana, India, Indo-China, Ivory Coast, Malesia, Mali, Myanmar, Nigeria, Papuaasia, Sri Lanka, Thailand, Togo, Vietnam	Australian, Paleotropical	Sandy grassland and alluvial and marine formations.
2. Restricted	<i>M. acetosella</i>	Angola, Zaire, Zambia	Paleotropical	Sandy watershed plains often seasonally flooded
	<i>M. dalzielii</i>	Ghana, Ivory Coast, Nigeria, Togo	Paleotropical	Sandy watershed plains often seasonally flooded
	<i>M. faradianensis</i>	Ghana, Guinea, Mali, Nigeria, Senegal	Paleotropical	Watershed plains often seasonally flooded
3. Endemic	<i>M. linearis</i>	Zambia	Paleotropical	Sandy grassland

Table 4. Distribution of Neotropical species of *Microstachys*.

Distribution	Species	Occurrence Area	Morrone's 2014 Provinces ¹	Habitat in Brazil
1. Wide	<i>M. bidentata</i>	Bolivia, Brazil (AM, BA, DF, GO, MA, MT, MG, PA, SP, TO), French Guiana, Paraguay, Venezuela	ATL, CAA, CER, CHA, GUL, MAD, PRF, RON, SAB	Cerrado s. str., Campo rupestre
		Argentina, Bolivia, Brazil (AM, BA, CE, DF, ES, GO, MA, MT, MS, MG, PA, PB, PR, PE, PI, RJ, RN, RS, RR, SC, SP, SE, TO), Colombia, Costa Rica, Cuba, Dominican Republic, Guyana, Haiti, French Guiana, Mexico, Panama, Paraguay, Peru, Puerto Rico, Suriname, Trinidad & Tobago, Venezuela	ATL, CAA, CER, CHA, CUB, GUA, GUT, GUL, HSP, LAN, MAG, PFL, MAD, PAR, PRM, PRF, PRC, PUC, ROD, ROR, SAB, TRI, XIT	Restinga, Cerrado s. str.
	<i>M. corniculata</i>			
	<i>M. salicifolia</i>	Argentina, Bolivia, Brazil (AP, AM, BA, CE, ES, GO, MT, MS, MG, PA, PI, RJ, SP, TO), Colombia, French Guiana, Guyana, Paraguay, Suriname, Venezuela	ATL, CAA, CER, CHA, GUL, MAD, PAR, PRF, RON, ROR, SAB, XIT	Cerrado s.lat., Campo rupestre
2. Restricted	<i>M. crotonoides</i>	Argentina, Bolivia, Brazil (BA, ES, GO, MA, MT, MS, MG, PA, PR, RS, RJ, SP), Paraguay.	ATL, ARF, CAA, CER, CHA, PAM, PAR, PRF, RON, YUN	Cerrado s. str.
	<i>M. daphnoides</i>	Brazil (BA, ES, GO, MG, RJ, SP)	ATL, CAA, CER, PRF	Campo rupestre
	<i>M. ditassoides</i>	Bolivia, Brazil (BA, DF, GO, MT, MS, MG, PI)	CAA, CER, CHA	Cerrado s. str., Campo rupestre

¹ ARF (*Araucaria* Forest), ATL (Atlantic), CAA (Caatinga), CER (Cerrado), CHA (Chacoan), CUB (Cuban), GUA (Guajira), GUL (Guianan Lowlands), GUT (Guatuso-Talamanca), JAM (Jamaica), LAN (Lesser Antilles), MAD (Madeira), MAG (Magdalena), PAM (Pampean), PAR (Pará), PFL (Pacific Lowlands), PRC (Puerto Rico), PRF (Parana Forest), PRM (Paramo), PUC (Puntarenas-Chiriqui), PUN (Puna), RON (Rondonia), ROR (Roraima), SAB (Sabana), TRI (Trinidad), XIT (Xingu-Tapajós), YUN (Yungas).

Distribution	Species	Occurrence Area	Morrone's 2014 Provinces ¹	Habitat in Brazil
	<i>M. glandulosa</i>	Brazil (BA, ES, GO, MT, MS, MG, PI, RJ, SP)	ATL, CER, PRF	Campo rupestre, Restinga
	<i>M. hispida</i>	Argentina, Bolivia, Brazil (BA, DF, GO, MT, MS, MG, PR, PE, SC, SP, RS), Paraguay	ATL, ARF, CAA, CER, CHA, PAM, PRF, RON, YUN	Cerrado s.lat., Campo rupestre
	<i>M. marginata</i>	Brazil (BA, MG)	CAA, CER	Cerrado s. str.
	<i>M. serrulata</i>	Argentina, Bolivia, Brazil (DF, GO, MT, MS, MG, PR, RS, SP), Paraguay	CER, CHA, PRF, RON, YUN	Cerrado s.lat., Campo rupestre
3. Endemic	<i>M. anisodonta</i>	Brazil (GO)	CER	Campo rupestre
	<i>M. dasycarpa</i>	Paraguay	CHA	Cerrado s. str.
	<i>M. heterodoxa</i>	Brazil (BA)	ATL, CAA	Campo rupestre, Restinga
	<i>M. liliputiana</i>	Brazil (GO)	CER	Campo rupestre
	<i>M. nana</i>	Brazil (PR)	ARF	Cerrado s. str.
	<i>M. nummularifolia</i>	Brazil (MG)	CER	Campo rupestre
	<i>M. revoluta</i>	Brazil (BA)	CAA	Campo rupestre
	<i>M. stipulacea</i>	Brazil (RS), Uruguay	PAM	Steppes
	<i>M. uleana</i>	Brazil (BA)	CAA	Campo rupestre

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Appendix. Voucher information for sequences used in this study. The following data are noted for each newly generated sequence: genus, species, voucher data including collector, collection number and herbarium acronym, GenBank accession numbers.

GENUS, *Taxon*, Voucher,

GYMNANTHES, *G. klotzschiana*, Pscheidt 47 (SP),

G. schottiana, Pscheidt 161 (SP),

MABEA, *M. fistulifera*, Pscheidt 135 (SP),

M. piriri, Cordeiro 2280A (SP),

MICROSTACHYS, *M. bidentata*, Pscheidt 116 (SP)

M. chamaelea, Ali SING 2014-280 (SP, SING)

M. corniculata, Pscheidt 126 (SP)

M. daphnoides, Pscheidt 61 (SP)

M. ditassoides, Pscheidt 90 (SP)

M. glandulosa, Pscheidt 186 (SP)

M. heterodoxa, Pscheidt 198 (SP)

M. hispida, Pscheidt 143 (SP)

M. marginata, Pscheidt 142 (SP)

M. nana, Pscheidt 187 (SP)

M. nummularifolia, Pscheidt 145 (SP)

M. revoluta, Pscheidt 193 (SP)

M. salicifolia, Pscheidt 125 (SP)

M. uleana, Pscheidt 200 (SP)

SEBASTIANIA, *S. brasiliensis*, Pscheidt 48 (SP)

S. brevifolia, Pscheidt 141 (SP)

A ser submetido à revista *Phytotaxa* (normas em Anexo 1).

Lectotypifications in the genus *Microstachys* (Euphorbiaceae)

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ABSTRACT

A number of names were found in need lectotypification in the genus *Microstachys* during the course of a revision of the genus. Most of the holotypes of many species have been destroyed during the II World War or was not designated in the protologue. Forty lectotypes are here designated based on eligible original or historical collections available.

Keywords: Hippomaneae, *Sebastiania*, taxonomy, grasslands.

INTRODUCTION

Jussieu (1824: 49) described *Microstachys* with three species previously recognized in the genus *Tragia* Linnaeus (1753: 980): *Tragia bicornis* Vahl (unpublished species in J herbarium), *T. chamaelea* Linnaeus (1753: 981) and *T. corniculata* Vahl (1798: 55-56). These species differ from the other *Tragia* by its 3-lobate calix and 3-lobate style and the similarity of the habit and seeds with other genera as *Sapium* Jacquin (1760: 31) and *Stillingia* Garden ex Linnaeus (1767: 611).

Many species currently recognized as *Microstachys*, and their synonyms, were originally described in other genera of Euphorbiaceae like *Sapium*, *Sebastiania* Sprengel (1820: 118) and *Tragia*. This scenario shows the difficult circumscription of the genera.

Whereas Jussieu (1824) established the genus *Microstachys*, Martius & Zuccarini (1824: 66) described the genus *Cnemidostachys* for Brazil. In their work with 17 species, the types of 14 species did not were designated. *Cnemidostachys* was established based on the differences of the species of *Tragia* mentioned above by Jussieu (1824).

Sprengel (1826) published a taxnomic treatment for 19 species of *Cnemidostachys* and recognizes *Microstachys* names amid two of these species: a combination of *Tragia chamaelea* and the illegitimate name *Cnemidostachys vahlii* Sprengel (1826: 834) [seen as *C. pahlii* in other publications].

Richard (1850) agreed with Jussieu (1824) in his delimitation of the genera *Microstachys* and *Tragia* and was the first author who recognized *Cnemidostachys* as synonym of *Microstachys*.

Later new species under the genera *Cnemidostachys* and *Microstachys* were published (e.g. Didrichsen 1853, Bentham 1854) until Baillon (1858) recognized *Microstachys* amid *Cnemidostachys* as a section of the genus *Stillingia*. The genus *Tragia* was also recognized as synonym of *Cnemidostachys*.

Otherwise, Müller Argoviensis (1863) reestablished *Microstachys*, with *Cnemidostachys* as synonym, and described new species and varieties, mostly for Brazil. Baillon (1865) treated again both genera as synonyms of the genus *Stillingia* and Müller Argoviensis (1866) finally recognized *Microstachys* in sections of the genus *Sebastiania* with *Cnemidostachys* as synonym.

Müller Argoviensis (1863, 1866, 1874) described several new varieties in the genus *Sebastiania* without designating the types of the studied specimens of 16 names. Likewise, José

Mariano da Conceição Vellozo did not designate the type of his species published in the plates of the Flora Fluminensis (Vellozo 1831) or in its taxonomic treatment (Vellozo 1881).

Pax & Hoffmann (1912) carried the last complete revision of the species though as section of the genus *Sebastiania*. Many years after, Webster (1994) noted that *Microstachys* could represent a distinct genus from *Sebastiania* according the habit and other characters.

Esser (1994) corroborated it in your study with the tribe Hippomaneae. However, only in 1998, Esser formally restored the genus with nomenclatural combinations of eight species recognized before as *Sebastiania*. Afterward this reestablishment, the genus *Microstachys* was not revised but new species were described and combined (e.g. Silva & Esser 2011).

As a result of an ongoing study toward a revision of the genus *Microstachys*, a number of synonyms have been found to need lectotypification. During the course of this study, most of the types of the synonyms of the species of *Microstachys* were seen via herbarium visits and loans. The objective of this paper is to lectotypify the species for which a holotype has been destroyed during the World War II or is missing or whose holotype was not designated. In general, the specimens designated here as lectotypes have been selected as the most representative material available among the eligible collections.

In this work, lectotypes are designated for 39 names, and these are synonymized under their accepted names in *Microstachys* (Govaerts *et al.* 2000, Silva & Esser 2011). In each case, the locality information given for the lectotype corresponds with the information found on the specimen itself. The genus *Microstachys* is under revision by the authors with additional phylogenic studies.

LECTOTYPIFICATIONS

The collections here designated as lectotypes were found on herbaria with annotations of the authors or based on the protologues.

Microstachys acetosella (Milne-Redhead 1933: tab. 3199) Esser (1999: 958).

= *Sapium acetosella* var. *acetosella* Radcliffe-Smith (1996: 319) – Lectotype (designated here):

ZAMBIA. Mwinilunga Distr., Cha Mwana plain, 14 December 1937, *Milne-Redhead* 2773 (K!, iso: BM!, PRE).

Microstachys bidentata (Martius & Zuccarini 1824a: 137) Esser (1999: 958).

= *Cnemidostachys scoparia* Martius & Zuccarini (1824a: 137, 1824b: 70) ≡ *Microstachys virgata* var. *scoparia* (Mart. & Zucc.) Müller Argoviensis (1863: 94) ≡ *Sebastiania virgata* var. *scoparia* (Mart. & Zucc.) Müller Argoviensis (1866: 1174) ≡ *Sebastiania bidentata* var. *scoparia* (Mart. & Zucc.) Pax & Hoffmann (1912: 114) – Lectotype (designated here): BRAZIL. Minas Gerais, “in campis montanis”, without date, *Martius s.n.* (M!).

= *Microstachys virgata* var. *odontococca* Müller Argoviensis (1863: 94) ≡ *Sebastiania virgata* var. *odontococca* Müller Argoviensis (1866: 1173) ≡ *Sebastiania bidentata* var. *odontococca* (Müll.Arg.) Pax & Hoffmann (1912: 113) ≡ *Microstachys bidentata* Klotzsch., *nomen in sched.* – Lectotype (designated here): BRAZIL. Without gazetteer and date, *Sellow s.n.* (K!).

Microstachys chamaelea (Linnaeus 1753: 981) Müller Argoviensis (1863: 95).

= *Sebastiania chamaelea* var. *africana* Pax & Hoffmann (1912: 117) – Lectotype (designated here): TOGO. Lome, without date, *Warnecke 186* (M!; iso: BM!, BR, GOET!, K!).

Microstachys corniculata (Vahl 1798: 55) Grisebach (1864: 49).

= *Cnemidostachys acalyphoides* Martius & Zuccarini (1824a: 138, 1824b: 71) ≡ *Sebastiania corniculata* var. *acalyphoides* (Mart. & Zucc.) Müller Argoviensis (1866: 1172) – Lectotype (designated here): BRAZIL. “Bahia et Minas Gerais ad flumen S. Francisci”, without date, *Martius s.n.* (M!).

= *Cnemidostachys longifolia* Martius & Zuccarini (1824b: 71) ≡ *Sebastiania corniculata* fo. *longifolia* (Mart. & Zucc.) Müller Argoviensis (1866: 1171) ≡ *Sebastiania corniculata* var. *longifolia* (Mart. & Zucc.) Müller Argoviensis (1874: 556) ≡ *Microstachys longifolia* Klotzsch ex Pax, in Pax, in Pax & Hoffmann (1912: 104), *nom. inval.* ≡ *Sebastiania salicifolia* var. *longifolia* (Mart. & Zucc.) Pax, in Pax & Hoffmann (1912: 104) – Lectotype (designated here): BRAZIL. “Inter Minas Novas et flumen S. Francisci”, 1864, *Martius s.n.* (M!; iso: MO!).

- = *Cnemidostachys prostrata* Martius & Zuccarini (1824a: 137, 1824b: 70) ≡ *Stillingia prostrata* (Mart. & Zucc.) Baillon (1865: 324) ≡ *Sebastiania corniculata* var. *prostrata* (Mart. & Zucc.) Müller Argoviensis (1866: 1172) – Lectotype (designated here): BRAZIL. Bahia, “ad flumen S. Francisci prope Juazeiro”, without date, *Martius s.n.* (M!).
- = *Cnemidostachys tragioides* Martius & Zuccarini (1824a: 137, 1824b: 70) ≡ *Sebastiania corniculata* var. *tragioides* (Mart. & Zucc.) Pax, in Pax & Hoffmann (1912: 98), *nom. illeg.* – Lectotype (designated here): BRAZIL. Bahia, “ad marginem fluminis S. Francisci prope Malhada”, without date, *Martius s.n.* (M!).
- = *Cnemidostachys patula* Martius & Zuccarini (1841: 8) ≡ *Sebastiania corniculata* var. *patula* (Mart. & Zucc.) Müller Argoviensis (1866: 1172) ≡ *Sebastiania hispida* var. *patula* (Mart. & Zucc.) Pax, in Pax & Hoffmann (1912: 111) – Lectotype (designated here): BRAZIL. “prope S. Georgium insulanorum”, 1839, *Martius Herb. Fl. Bras.* 427 (M!; iso: BM!, HBG!, K!, L!, M!, MO!, NY!, P!, S!).
- = *Cnemidostachys campestris* Mart. ex Baill. in Baillon (1858: 516), *nom. inval.* ≡ *Stillingia campestris* Baillon (1858: 516) ≡ *Sebastiania corniculata* var. *campestris* (Baill.) Müller Argoviensis (1866: 1169) ≡ *Microstachys campestris* Klotzsch ex Pax in Pax, in Pax & Hoffmann (1912: 101), *nom. inval.* ≡ *Sebastiania glandulosa* var. *campestris* (Baill.) Pax, in Pax & Hoffmann (1912: 101) – Lectotype (designated here): BRAZIL. Without gazetteer and date, *Martius Herb. Fl. Bras.* 907 (M!; iso: BM!, K!, L, M!, NY!, P!, W!, WU!).
- = *Sebastiania corniculata* var. *villaricensis* Müller Argoviensis (1866: 1170) – Lectotype (designated here): BRAZIL. Minas Gerais, without date, *Pohl 1720* (holo: B!; iso: K!).
- = *Sebastiania corniculata* var. *rufescens* fo. *discopoda* Müller Argoviensis (1866: 1170) – Lectotype (designated here): BRAZIL. Minas Gerais, without date, *Martius Herb. Fl. Bras.* 906 (M!, iso: K!).
- = *Tragia pilosa* Vellozo (1881: 395) – Lectotype (designated here): Fl. Flumin. Icon. 10: tab. 9 (1831).
- = *Microstachys micrantha* Benth (1854: 326) ≡ *Sebastiania corniculata* var. *micrantha* (Benth.) Müller Argoviensis (1866: 1173) ≡ *Sebastiania micrantha* (Benth.) Lanjouw (1939: 704) – Lectotype (designated here): BRAZIL. Pará, July 1849, *Spruce 212* (K!; iso: K!).
- = *Tragiopsis fruticulosa* Karsten (1859: 5) ≡ *Microstachys fruticulosa* (H.Karst.) Karsten (1869: 33) – Lectotype (designated here): VENEZUELA. Villavicencio, Llano de St. Martin,

without date, *Karsten s.n.* (W!; iso: GOET!, O!, W!).

- = *Sebastiania corniculata* var. *acalyphoides* fo. *erecta* Müller Argoviensis (1866: 1172) – Lectotype (designated here): BRAZIL. Bahia, “ad St. Thomé”, without date, *Blanchet 3756* (P!; iso: BM!).
- = *Sebastiania corniculata* var. *fischeri* Müller Argoviensis (1866: 1169) ≡ *Microstachys fischeri* Klotzsch ex Pax in Pax, in Pax & Hoffmann (1912: 104), *nom. inval.* ≡ *Sebastiania salicifolia* var. *fischeri* (Müll.Arg.) Pax, in Pax & Hoffmann (1912: 104) – Lectotype (designated here): BRAZIL. Without gazetteer and date, *Pohl 1719* (W; iso: K!, KIEL!).
- = *Sebastiania corniculata* var. *egensis* Müller Argoviensis (1874: 562) – Lectotype (designated here): BRAZIL. “Alto Amazonas prope Ega”, without date, *Poeppig 3071* (W!; iso: GOET!).
- = *Sebastiania corniculata* var. *glabrata* fo. *erecta* Müller Argoviensis (1866: 1172) – Lectotype (designated here): BRAZIL. Bahia, without date, *Salzmann 487* (MPU!; iso: W!).
- = *Sebastiania corniculata* var. *poeppigii* Müller Argoviensis (1866: 1173) – Lectotype (designated here): BRAZIL. Amazonas, without date, *Poeppig 2978* (W!; iso: GOET!).
- = *Sebastiania corniculata* var. *heterophylla* Müller Argoviensis (1874: 563) – Lectotype (designated here): BRAZIL. “Goiás secus Rio Tocantins”, without date, *Burchell 8527* (BR!).
- = *Sebastiania corniculata* var. *potamophila* Müller Argoviensis (1874: 562) – Lectotype (designated here): BRAZIL. “Goiás ad Rio Tocantins prope Porto Nacional”, without date, *Burchell 8642* (BR!).
- = *Sebastiania mexicana* Brandegees (1905: 205) ≡ *Sebastiania purpurea* Brandegees, *nom. inval.* – Lectotype (designated here): MEXICO. Sinaloa, Culiacan, 1904, *T.S. Brandegees s.n.* (UC!).
- = *Sebastiania salicifolia* var. *glaziovii* Pax & Hoffmann (1912: 104) – Lectotype (designated here): BRAZIL. “Rio de Janeiro und Minas Gerais”, without date, *Glaziou 15406* (B, iso: K!).

Microstachys daphnoides (Martius & Zuccarini 1824a: 139, 1824b: 71) Müller Argoviensis (1863: 91).

≡ *Cnemidostachys daphnoides* Martius & Zuccarini (1824a: 139, 1824b: 71) ≡ *Microstachys daphnoides* var. *genuina* Müller Argoviensis (1863: 91), *nom. inval.* ≡ *Sebastiania*

daphnoides (Mart. & Zucc.) Müller Argoviensis (1866: 1167) ≡ *Sebastiania daphnoides* var. *genuina* Müller Argoviensis (1866: 1168), *nom. inval.* ≡ *Sebastiania myrtilloides* var. *daphnoides* (Mart. & Zucc.) Pax, in Pax & Hoffmann (1912: 94) – Lectotype (designated here): BRAZIL. Minas Gerais “in campis”, without date, *Martius s.n.* (M!).

= *Cnemidostachys myrtilloides* Martius & Zuccarini (1824a: 137, 1824b: 67) ≡ *Microstachys daphnoides* var. *myrtilloides* (Mart. & Zucc.) Müller Argoviensis (1863: 91) ≡ *Stillingia myrtilloides* (Mart. & Zucc.) Baillon (1865: 323) ≡ *Sebastiania daphnoides* var. *myrtilloides* (Mart. & Zucc.) Müller Argoviensis (1866: 1167) ≡ *Sebastiania myrtilloides* (Mart. & Zucc.) Pax, in Pax & Hoffmann (1912: 93) ≡ *Sebastiania myrtilloides* var. *martiana* Pax, in Pax & Hoffmann (1912: 94), *nom. illeg. superfl.* – Lectotype (designated here): BRAZIL. Minas Gerais, “in alpestris districtus adamantum”, without date, *Martius s.n.* (M!; iso: M!).

= *Cnemidostachys oleoides* Martius & Zuccarini (1824a: 137, 1824b: 71) ≡ *Microstachys daphnoides* var. *oleoides* (Mart. & Zucc.) Müller Argoviensis (1863: 91) ≡ *Sebastiania daphnoides* var. *oleoides* (Mart. & Zucc.) Müller Argoviensis (1866: 1168) ≡ *Sebastiania oleoides* (Mart. & Zucc.) Müller Argoviensis (1874: 548) – Lectotype (designated here): BRAZIL. “Minas Gerais prope Villa Rica”, without date, *Martius s.n.* (M!).

Microstachys ditassoides (Didrichsen 1853: 88) Esser (1999: 958).

= *Microstachys sessilifolia* fo. *apiculata* Müller Argoviensis (1863: 95) ≡ *Sebastiania ditassoides* fo. *apiculata* (Müll.Arg.) Müller Argoviensis (1866: 1174) – Lectotype (designated here): BRAZIL. “inter Alegres et Rio São Francisco”, without date, *Riedel s.n.* (P!; iso: K!, P!).

Microstachys hispida (Martius & Zuccarini 1824b: 71) Govaerts in Govaerts *et al.* (2000: 1190).

= *Cnemidostachys crotonoides* Martius & Zuccarini (1824b: 71) ≡ *Stillingia crotonoides* (Mart. & Zucc.) Baillon (1858: 516) ≡ *Sebastiania corniculata* fo. *crotonoides* Müller Argoviensis (1866: 1171) ≡ *Sebastiania corniculata* var. *intercedens* Müller Argoviensis (1874: 556), *nom. inval.* ≡ *Sebastiania hispida* var. *crotonoides* (Mart. & Zucc.) Pax, in Pax & Hoffmann (1912: 110) ≡ *Sebastiania hispida* var. *intercedens* (Müll.Arg.) Pax, in Pax & Hoffmann (1912: 111), *nom. inval.* – Lectotype (designated here): BRAZIL. Minas Gerais, “in campis”, without date, *Martius s.n.* (M!).

- ≡ *Cnemidostachys hispida* Martius & Zuccarini (1824b: 71) ≡ *Sebastiania corniculata* var. *hispida* (Mart. & Zucc.) Müller Argoviensis (1866: 1172) ≡ *Sebastiania hispida* (Mart. & Zucc.) Pax, in Pax & Hoffmann (1912: 105) ≡ *Sebastiania hispida* var. *euhipida* Pax, in Pax & Hoffmann (1912: 109), *nom. inval.* – Lectotype (designated here): BRAZIL. Minas Gerais, “habitat in campis”, without date, *Martius s.n.* (M!).
- = *Sebastiania corniculata* var. *klotzschiana* Müller Argoviensis (1866: 1169) ≡ *Sebastiania hispida* var. *klotzschiana* (Müll.Arg.) Pax, in Pax & Hoffmann (1912: 106) – Lectotype (designated here): BRAZIL. Minas Gerais, 1838, *Claussen 749* (S!; iso: NY!).
- = *Sebastiania corniculata* var. *megapontica* Müller Argoviensis (1873: 559) ≡ *Sebastiania hispida* var. *megapontica* (Müll.Arg.) Pax, in Pax & Hoffmann (1912: 108) ≡ *Sebastiania hispida* fo. *villosula* Pax, in Pax & Hoffmann (1912: 109) – Lectotype (designated here): BRAZIL. Goiás, Megaponte, without, *Pohl 956* (W!).
- = *Sebastiania hispida* var. *cuyabensis* Pax & Hoffmann (1924: 200) – Lectotype (designated here): BRAZIL. Mato Grosso, without date, *Malme s.n.* (S!).
- Microstachys marginata*** (Mart. & Zucc.) Klotzsch ex Müll.Arg. in Müller Argoviensis (1863: 90).
- ≡ *Cnemidostachys marginata* Martius & Zuccarini (1824a: 137, 1824b: 68) ≡ *Sebastiania marginata* (Mart. & Zucc.) Müller Argoviensis (1866: 1166) ≡ *Sebastiania marginata* var. *genuina* Müller Argoviensis (1866: 1166), *nom. inval.* – Lectotype (designated here): BRAZIL. Minas Gerais, “in campis districtum adamantum”, without date, *Martius s.n.* (M!; iso: M!).
- = *Cnemidostachys coriacea* Martius & Zuccarini (1824a: 139, 1824b: 71) ≡ *Microstachys marginata* var. *minor* Müller Argoviensis (1863: 90) ≡ *Sebastiania marginata* var. *minor* (Müll.Arg.) Müller Argoviensis (1866: 1166) ≡ *Stillingia coriacea* (Mart. & Zucc.) Baillon (1865: 328) ≡ *Sebastiania marginata* var. *coriacea* (Mart. & Zucc.) Pax, in Pax & Hoffmann (1912: 92) ≡ *Microstachys coriacea* (Mart. & Zucc.) Klotzsch, *nomen in sched* – Lectotype (designated here): BRAZIL. Minas Gerais, “in montosis apricis”, without date, *Martius s.n.* (M!).

Microstachys serrulata (Mart. & Zucc.) Müller Argovienensis (1863: 90).

- ≡ *Cnemidostachys serrulata* Martius & Zuccarini (1824a: 137, 1824b: 68) ≡ *Microstachys serrulata* var. *genuina* Müller Argovienensis (1863: 90), *nom. inval.* ≡ *Microstachys serrulata* var. *klotzschiana* Müller Argovienensis (1863: 90), *nom. inval.* ≡ *Stillingia serrulata* (Mart. & Zucc.) Baillon (1865: 324) ≡ *Sebastiania serrulata* (Mart. & Zucc.) Müller Argovienensis (1866: 1167) ≡ *Sebastiania serrulata* var. *genuina* Müller Argovienensis (1866: 1167), *nom. inval.* ≡ *Sebastiania serrulata* var. *klotzschiana* (Müll.Arg.) Müller Argovienensis (1866: 1167), *nom. inval.* – Lectotype (designated here): Nov. Gen. Sp. Pl. 1: tab. XLII (1824).
- = *Microstachys serrulata* var. *oncoblepharis* Müller Argovienensis (1863: 91) ≡ *Sebastiania serrulata* var. *oncoblepharis* (Müll.Arg.) Müller Argovienensis (1866: 1167) – Lectotype (designated here): BRAZIL. Without gazetteer, 1809, *Pohl s.n.* (M!).
- = *Sebastiania anisodonta* Müller Argovienensis (1874: 550) – Lectotype (designated here): BRAZIL. Goiás, Serra D'Ourada, without date, *Pohl 1555* (holo: M!; iso: W!).
- = *Sebastiania serrulata* var. *hispida* Müller Argovienensis (1874: 549) – Lectotype (designated here): BRAZIL. Goiás, Araracoara, without date, *Riedel 2200* (F!).
- = *Sebastiania serrulata* var. *oblongifolia* Müller Argovienensis (1874: 550) – Lectotype (designated here): BRAZIL. Goiás, without date, *Burchell 7014* (K!).

Nomina nuda

During the life of Johann Friedrich Klotzsch several notes were left in herbarium specimens as combinations of the species described by Martius & Zuccarini (1824a, 1824b), but these combinations were never been published. Müller Argoviensis (1866, 1874) also used the same material to describe new varieties to the genus *Sebastiania* or to combine names of the species of Martius and Zuccarini into this genus. In the treatment of the genus *Sebastiania*, Pax & Hoffmann (1912) cited the names that of the species of the genus *Microstachys* left by Klotzsch.

The invalidly published names of Klotzsch and two other names are shown as follow:

Microstachys adscendens Klotzsch in Pax & Hoffmann (1912: 103).

Microstachys apiculata Klotzsch in Pax & Hoffmann (1912: 115).

Microstachys bidentata Klotzsch in Pax & Hoffmann (1912: 113).

Microstachys blepharophylla Klotzsch in Pax & Hoffmann (1912: 110).

Microstachys campestris Klotzsch in Pax & Hoffmann (1912: 101).

Microstachys coriacea (Mart. & Zucc.) Klotzsch in Pax & Hoffmann (1912: 92).

Microstachys fischeri Klotzsch in Pax & Hoffmann (1912: 104).

Microstachys glandulosa Klotzsch in Pax & Hoffmann (1912: 101).

Microstachys hastata Klotzsch in Baillon (1865: 324).

Microstachys hastata Klotzsch in Pax & Hoffmann (1912: 115).

Microstachys hispida Klotzsch in Pax & Hoffmann (1912: 110).

Microstachys lanceolata Splitg. ex Lanj. in Lanjouw (1931: 170).

Microstachys ledifolia Klotzsch in Pax & Hoffmann (1912: 115).

Microstachys leucoblepharis Klotzsch in Pax & Hoffmann (1912: 110).

Microstachys longifolia Klotzsch in Pax & Hoffmann (1912: 104).

Microstachys olfersiana Klotzsch in Pax & Hoffmann (1912: 102).

Microstachys ovata Klotzsch in Pax & Hoffmann (1912: 102).

Microstachys parvifolia Klotzsch in Pax & Hoffmann (1912: 102).
Microstachys parvifolia Klotzsch in Pax & Hoffmann (1912: 116).
Microstachys patula Klotzsch in Pax & Hoffmann (1912: 111).
Microstachys patula Klotzsch in Pax & Hoffmann (1912: 113).
Microstachys pubescens Klotzsch in Pax & Hoffmann (1912: 106).
Microstachys rufescens Klotzsch in Pax & Hoffmann (1912: 110).
Microstachys sellowiana Klotzsch in Pax & Hoffmann (1912: 103).
Microstachys serrata Klotzsch in Pax & Hoffmann (1912: 95).
Microstachys stipulacea Müll. Arg. in Baillon (1858: 516).
Microstachys supina Klotzsch in Pax & Hoffmann (1912: 116).
Microstachys vellerifolia Klotzsch in Pax & Hoffmann (1912: 114).
Microstachys velutina Klotzsch in Pax & Hoffmann (1912: 101).
Microstachys patula Klotzsch in Pax & Hoffmann (1912: 111).

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CAPÍTULO 5

A ser submetido à revista *Candollea* (normas em Anexo 3).

A new species of *Microstachys* (Euphorbiaceae) in Paraguay

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Abstract

A study in herbaria led to the discovery of a new taxon endemic to Paraguay, and a new species, *Microstachys dasycarpa* Pscheidt & al. is described and illustrated. The genus is represented by other four species at the Chaco grasslands (*M. corniculata*, *M. hispida* and *M. serrulata*) in Paraguay, with which this new species is compared.

Key-words

Hippomaneae – Sebastiania – Taxonomy

Microstachys A. Juss. is part of Hippomaneae, the second largest tribe of Euphorbioideae (ESSER, 2001). The genus is currently accepted with 24 species (PSCHEIDT & al., in press), 19 in Neotropics and five in Paletropic / Australian regions.

The genus is widely spread in pantropical open vegetation (grasslands, seashores). Species of the genus are perennial herbs or subshrubs with alternate leaves, margins entire or densely serrate with small glandular teeth, inflorescences often leaf-opposite, with bracts bearing a pair of glands, female flowers often separated from the male ones; floral buds inclined and initially covered by their large bracts; ovary and fruit with appendages, or rarely smooth and seeds are carunculated.

Since its first description by JUSSIEU (1824), *Microstachys* was widely accepted until MÜLLER (1866) treated it as section of *Sebastiania* Spreng. ESSER (1998) reestablished the genus with two other sections of *Sebastiania* as synonyms (*Elachocroton* F.Muell. and *Microstachyopsis* (Müll.Arg.) Pax). *Microstachys* is very probably monophyletic (ESSER & al., 1998), and shares with *Sebastiania* sessile staminate flowers with mostly free sepals and three free stamens (ESSER, 2012).

A new species endemic to Paraguay is presented here with a full description, accompanied by a illustration and a discussion of the morphological affinities, along with an assessment of it conservation status based on the IUCN Red List Categories and Criteria (IUCN, 2001).

Microstachys dasycarpa Pscheidt, Esser & Cordeiro, **spec. nova** (Fig. 1 A-I).

Typus: PARAGUAY. **Dpto Boquerón:** Ruta Transchaco 25 km S de Nueva Asunción, 12.XII.1987, *A. Schinini & Palacios* 25685 (holo-: CTES!, iso-: SP!).

Microstachys dasycarpa is related to *M. bidentata* by linear-lanceolate leaves and short stigmas, but differs by discoid glands at leaves, cylindrical stigmas and pubescent ovary whereas *M. bidentata* has crateriform and smaller glands at leaves, globose stigmas and glabrous ovary.

Monoecious subshrub, caespitose, 1-2 m tall. Branches cylindrical, striated, with lenticels, medulla filled, glabrous. Leaves alternate, concolor; petiole 2-4 mm long, sparsely pubescent to glabrescent, hairs 0.5 mm long; blade linear to lanceolate, 2.5-5 x 0.25-0.5 cm, chartaceous, base attenuate, margin serrulate with adpressed teeth, plane to revolute, apex obtuse; sparsely hispid abaxially and adaxially, hairs 0.2-0.5 mm long; midvein distinct, secondary veins inconspicuous; with 1 pair of basal, discoid, abaxial and submarginal discoid gland, 0.4-0.5 mm in diameter, additional glands usually absent, stipules persistent, ca. 0.5 x 0.5 mm, deltoid, hispid. Inflorescences in spiciform, leaf-opposite thyrses, with numerous staminate cymules and 1-2 pistillate cymules below, glabrous except for the ovaries; floral buds covered by large bracts; the rachis 1.5-5 cm long, glabrous; bracts ovate, 0.4-0.6 x 0.5 mm, glabrous, with 1 pair of basal and globose glands, apex bilobed, 0.2-0.25 mm in diameter, apex acuminate, margin serrulate. Staminate cymules with (1-)3 flowers, petiolate, pedicel 0.2 mm long; sepals 3, free, orbicular to ovate, 0.5-0.6 x 0.5 mm, glabrous, eglandular, margin lacerate, apex rounded, petals 0; stamens 3, filaments cylindrical, 0.2-0.25 mm long, anthers globose, 0.3-0.5 mm long. Pistillate flowers subsessile to short-pedicellate, pedicel 0.2 mm long, glabrous; sepals 3, free, ovate, 0.5-0.75 x 0.3 mm, glabrous, margin entire, apex obtuse; petals 0; ovary oblong, 0.9 x 0.7 mm, tomentose, hairs 0.2 mm long, with pyramidal appendages in each mericarp; style absent, stigmas 3, cylindrical, erect in bud and spreading in the anthesis, 0.75 x 0.25 mm, glabrous. Fruit capsular, septicide-loculicide, 6 x 5 mm, oblong, smooth or

with inconspicuous apical appendages, sparsely hairy, pedicel 1-1.5 mm long; stigmas persistent, ca. 0.75 x 0.25 mm. Seeds not observed.

Distribution and habitat. — *Microstachys dasycarpa* is endemic to Paraguay, occurring around Nueva Asunción (fig. 2) on sandy grassland of Chacoan province (Morrone, 2014), at 280-300 m.a.s.l.

IUCN conservation assessment. — Engangered (EN). There are only five know specimens on herbaria collected between 1987 and 1998 in surroundings of Nueva Asunción. No recent collections were found.

Etymology. — The epithet is related to the indumentum of the ovary.

Phenology. — Flowering and fruiting between November and January.

Taxonomic notes. — In Paraguay, *Microstachys* is represented by four species from Chaco grasslands: *M. corniculata*, *M. hispida* and *M. serrulata*. *M. dasycarpa* differs from *M. corniculata* by leaves with attenuate base and obtuse apex (vs leaves with cordate to rounded base and acuminate apex in *M. corniculata*); from *M. bidentata*, that also have pubescent ovary, it may be distinguished by linear to lanceolate leaves with discoid glands (vs ovate leaves with crateriform glands in *M. bidentata*); and from *M. serrulata* it differs by margin serrulate with adpressed teeth, plane to revolute and fruit smooth or with inconspicuous apical appendages (vs serrate margin and fruit with plenty appendages).

Paratypes. — **PARAGUAY. Dpto Boquerón:** Nueva Asunción, between Parque Nacional Teniente Agripino Enciso and Nueva Asunción, 27.I.1995, *E.M. Zardini & A. Acosta* 42235 (M!), *E.M. Zardini & A. Acosta* 42388 (M!); proposed National Park Medanos del Chaco, 13.XII.1998, *E.M. Zardini & N. Duarte* 49716 (M!).

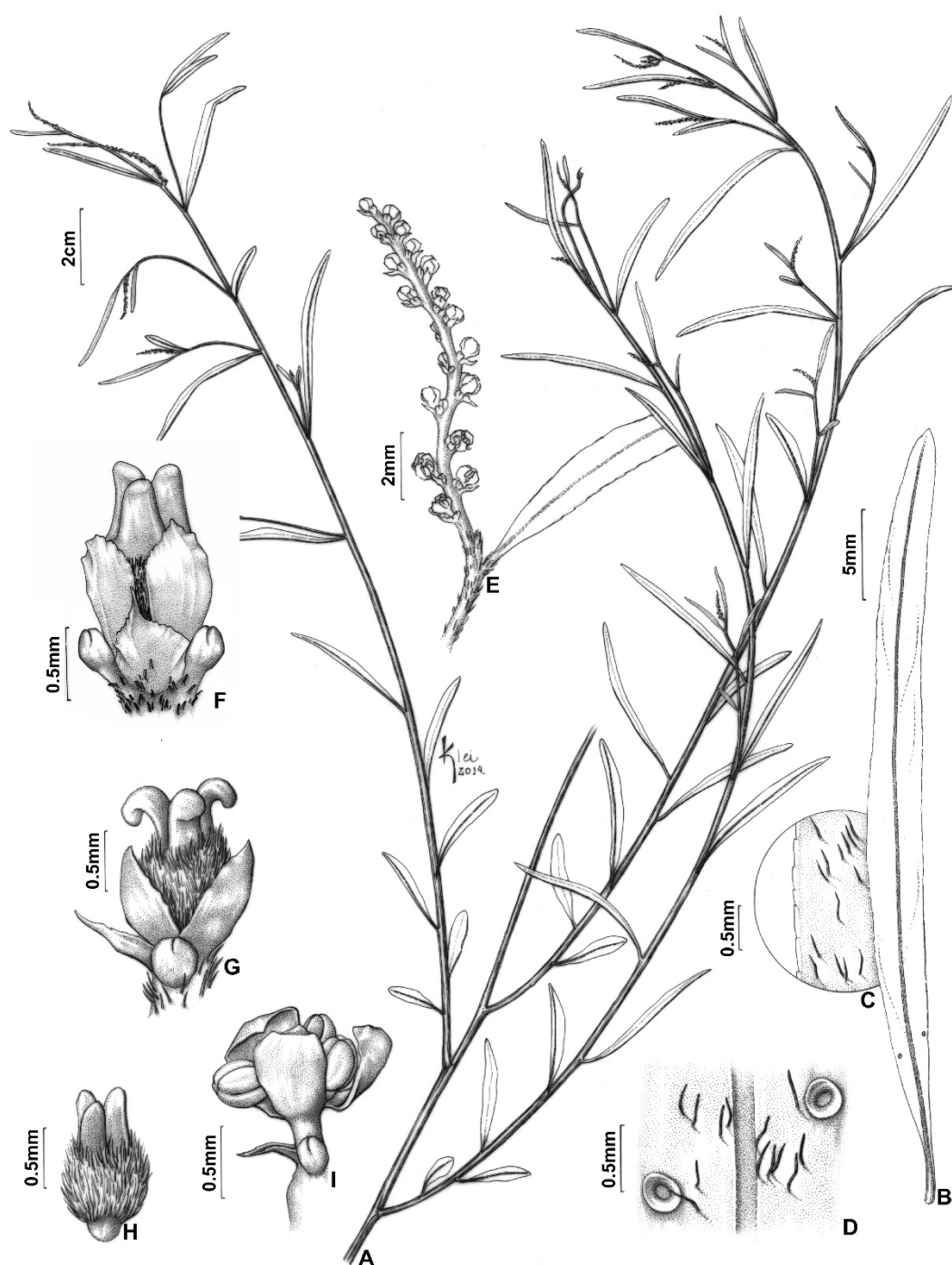


Figure 1. *Microstachys dasycarpa*. A. Branch. B. Leaf C. Leaf indumentum. D. Leaf glands. E. Inflorescence. F. Female flower in frontal view with bract. G. Female flower in lateral view with bract. H. Female flower. I. Male flower in lateral view. (A. Schinini & Palacios 25685).

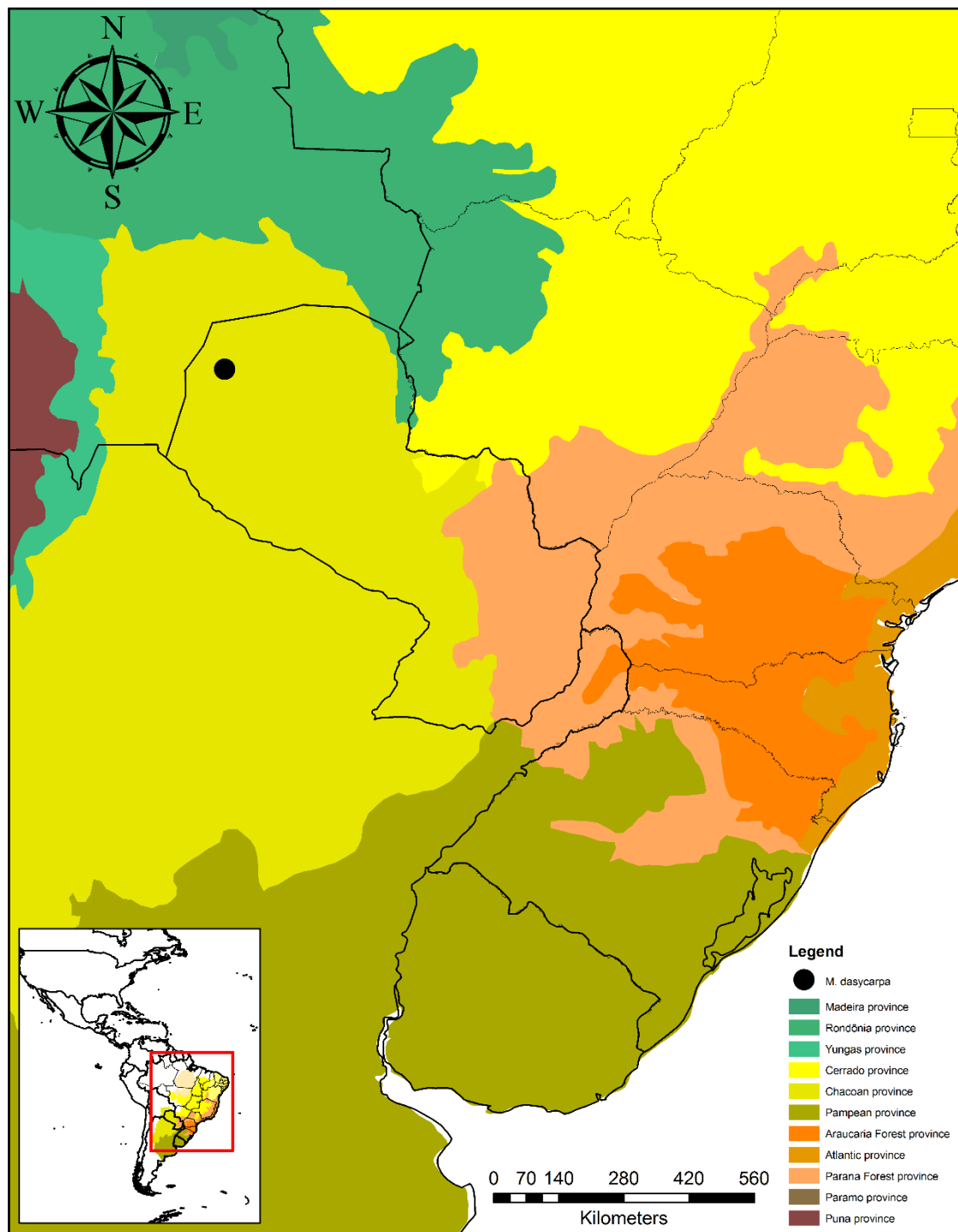


Figure 2. Distribution map of *Microstachys dasycarpa* (QGIS with Morrone 2014 phytogeographic provinces for Neotropical region).

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A new species and two new combinations in *Microstachys* (Euphorbiaceae) from Brazil

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Abstract

Microstachys liliputiana a new species endemic to Chapada dos Veadeiros region, State of Goiás, Brazil, is here described and illustrated. It resembles *M. nana*, a southern Brazilian species endemic to the state of Paraná, by its subshrubby habit, with a well developed subterraneous system, glabrous to glabrescent leaves and stems, elliptic leaves, flowers and fruits reddish, ovary with developed appendages, inflorescences sparsiflorous, distic/espirate, with pistillate flowers on the base of the rachys. Two new combinations in *Microstachys* for species originally described in the genus *Sebastiania* are also provided, *M. salicifolia*, and *M. anisodonta*.

Key words: Hippomaneae, cerrado, Chapada dos Veadeiros, *Sebastiania*.

The genus *Microstachys* of Hippomaneae has a pantropical distribution (Esser 1998) with approximately 24 species, five of them from Paleotropical and Australian regions and the remaining from the Neotropics, with its center of diversity in eastern Brazil (Esser 1998, Silva and Esser 2011).

Most endemic Brazilian species of *Microstachys* are from Espinhaço range, in the states of Minas Gerais and Bahia, and Chapada dos Veadeiros, in the state of Goiás, where they occur on cerrado and campos rupestres vegetation.

Despite the great morphological variability, the genus can be recognized among the other ones from Hippomaneae by its subshrubby habit, spiciform and usually leaf-opposite inflorescences, fruits usually with spine-like appendages, and oblong seeds with truncate apex and large, stipitate and lenticular when dry caruncle (Esser 1998, Silva and Esser 2011).

Microstachys has long been treated as a section of *Sebastiania* Spreng. (see Müller 1866, 1874, Pax and Hoffmann 1912), but Webster (1994) mentioned it as a potentially distinct genus, which was restored as genus by Esser (1998) along with other *Sebastiania* sections (*Elachocroton* F. Muell. and *Microstachyopsis* Müll.Arg). Some Brazilian species currently recognized in *Microstachys* were treated in floras and revisions under their names in *Sebastiania* (i.e. Cordeiro 1989, 1992, 1995, 2004, Oliveira 1975, 1983-85, 1991, Santos and Sales 2009), or as *Microstachys* (i.e. Esser 1998, Pscheidt and Cordeiro 2012, and Silva and Esser 2011).

The core area of Cerrado is located in the Central Brazil plateau and shows a characteristic xeromorphic and semi-deciduous vegetation which differs from other savannas by its diversity of structural forms and species (Eiten 1972, Rizzini 1997). After *Croton* and *Manihot*, *Microstachys*, with eight species, is the third largest genus of Euphorbiaceae in cerrado of Centro-Oeste (Cordeiro et al. 2015).

Material and methods

The new species was described based on herbarium collections and analyses of the populations on field. The terminology used follows Radford et al. (1974) and Webster (1994). Data on geographic distribution and habitat were obtained from herbarium labels, literature, and field studies.

Microstachys liliputiana M. J. Silva, Pscheidt and Cordeiro, *sp. nov.* (Fig. 1, 2).

Type: Brazil, Goiás, Cavalcante, Parque Nacional da Chapada dos Veadeiros, Serra do Pouso Alto, em campo úmido próximo a córrego, 13°56'39.03"S, 47°29'52.08"W, 1084 m, 13.X.2013, (fl, fr), M.J. Silva et al. 4500 (holotype: UFG, isotype: CEN).

Differs from Microstachys nana, an endemic southern Brazilian species, by its succulent stem, spatulate leaves with decurrent base and lacking glands at the base of abaxial surface, fruits with two conical appendages at the apex of each carpel versus filiform stem, elliptic leaves with four to six pateliform glands at the base of abaxial surface, fruits with crested appendages throughout each carpel.

Subshrubs 4.5-15 cm tall, with a main root up to 7 cm long. Branches caespitose, cylindrical to angulate, reddish, glabrous to strigose, hairs 0.2 mm long. Leaves concolor, spirulate; petiole 2-5 mm long, glabrescent, reddish, canaliculated above, hairs 0.2 mm long; blade spatulate, 0.6-1.6 × 0.3-4.2 cm, carnose, glabrous, brochidodromous, central vein reddish, more evident on the abaxial surface, 4-5 pairs of inconspicuous secondary veins, marginal glands sparse, 0.1 mm in diameter, base cuneate, margin entire, plane, apex obtuse; stipules deltoid, 1 × 1 mm, glabrous. Inflorescence in spiciform thyrses, 1-3 cm long, leaf-opposite, rachis angulose, erect, bisexual or staminate, with one proximal pistillate flower and ca. 20 staminate cymules spirulate arranged, glabrous; bracts 0.4-0.5 × 0.6-1.0 mm, basal sessile glands 0.2 mm in diameter, apex acute, margin lacerate, glabrous, pistillate 1. Staminate flower 1-3, pedicellate, pedicel 0.2-0.3 mm long, glabrous; sepals 0.8-1.1 × 0.4-0.5 mm, apex obovate with a distinct central vein, margin entire; stamens 3, filaments up to 0.6 mm long, anthers 0.3-0.4 mm long, horizontally dehiscent. Pistillate flower sessile; sepals 0.5-1 × 0.4-0.9 mm, eglandular, apex obtuse, uninerved, margin entire; ovary 1.7-1.8 × 1.4-1.5 mm, with appendages, glabrous; stigmas 2.2-2.5 mm long, erect, connate at base. Fruit oblong, 2.9-3 × 2.9-5 mm, glabrous, reddish, sessile; with horn-shaped appendages in each mericarp, ca. 0.5 mm long; columella persistent, apically alate, 3 mm long. Seed globose, 1.9-2 × 3.6-3.8, testa spotted, cinereous to brownish, caruncle sessile, yellowish.

Vouchers: BRAZIL. Goiás: Alto Paraíso de Goiás, Parque Nacional da Chapada dos Veadeiros, 12.XI.1996, *M.A. da Silva and A.J.V. dos Santos* 3229 (IBGE, SP!); Cavalcante, Parque Nacional Chapada dos Veadeiros, campo úmido próximo a Córrego no sopé da Serra do Pouso

Alto, 13°56'31.03"S, 47°29'54.84"W, 1078 m, 4.III.2012, fl., *M.J.Silva et al.* 4126 (UFG); São João d'Aliança, Parque Nacional Chapada dos Veadeiros, 15.XI.2007, *J.F.B. Pastore et al.* 2311 (HUEFS).

Distribution and ecology: *Microstachys liliputiana* has only been found in adjacent areas to Morro do Peito de Moça and Serra do Pouso Alto, in Alto Paraíso de Goiás and Cavalcante, respectively (Fig. 3). Both localities are situated in the Chapada dos Veadeiros region, a complex of highlands located in the north-eastern portion of Goiás. It grows in wet grassland in Cerrado province (Morrone 2014) near to streams on clay soil, with dense populations usually on the shade of Xyridaceae and Cyperaceae species, between 1.000-1.400 m.

Etymology: The specific epithet refers to the diminutive aspect of the plant.

Conservation Status: Critically Endangered (CR). This species is only known from Chapada dos Veadeiros region where it is abundant in the grassland in a range of 50.000 km². The Chapada dos Veadeiros National Park is a protected area recognised by UNESCO as a World Heritage Centre.

Relationships: *Microstachys liliputiana* is morphologically interesting: is the only species in the genus with fleshy leaves. The species superficially resembles *M. nana* M. J. Silva and Esser in its diminute habit (up to 12 cm alt.), glabrous to glabrescent branches and reddish ovary and fruits.

However, *M. liliputiana*, can be differentiated from *M. nana* by its stem with conspicuous internodes (vs. inconspicuous in *M. nana*), branches papillose on the younger portion (vs. smooth), fleshy leaves with entire margin and inconspicuous veins (vs. membranaceous leaves with irregular and sparsely crenate margin), pistillate flowers sessile (vs. pedicellate, with 1.2-1.3 long pedicel), thyrses 2-3.2 cm (vs. 3-7.5 cm), free styles (vs. united by 0.5 mm at the base), staminate bracts 0.4–0.5, widely triangular (vs. 0.8-0.7 mm, oval a widely oval), pistillate sepals oblong-obovate, uninerved, with entire margin (vs. widely ovate, with lacerate-denticulate margin), and fruits, oblongoid, 4–5 mm long (vs. globoid, 2.6-3 mm).

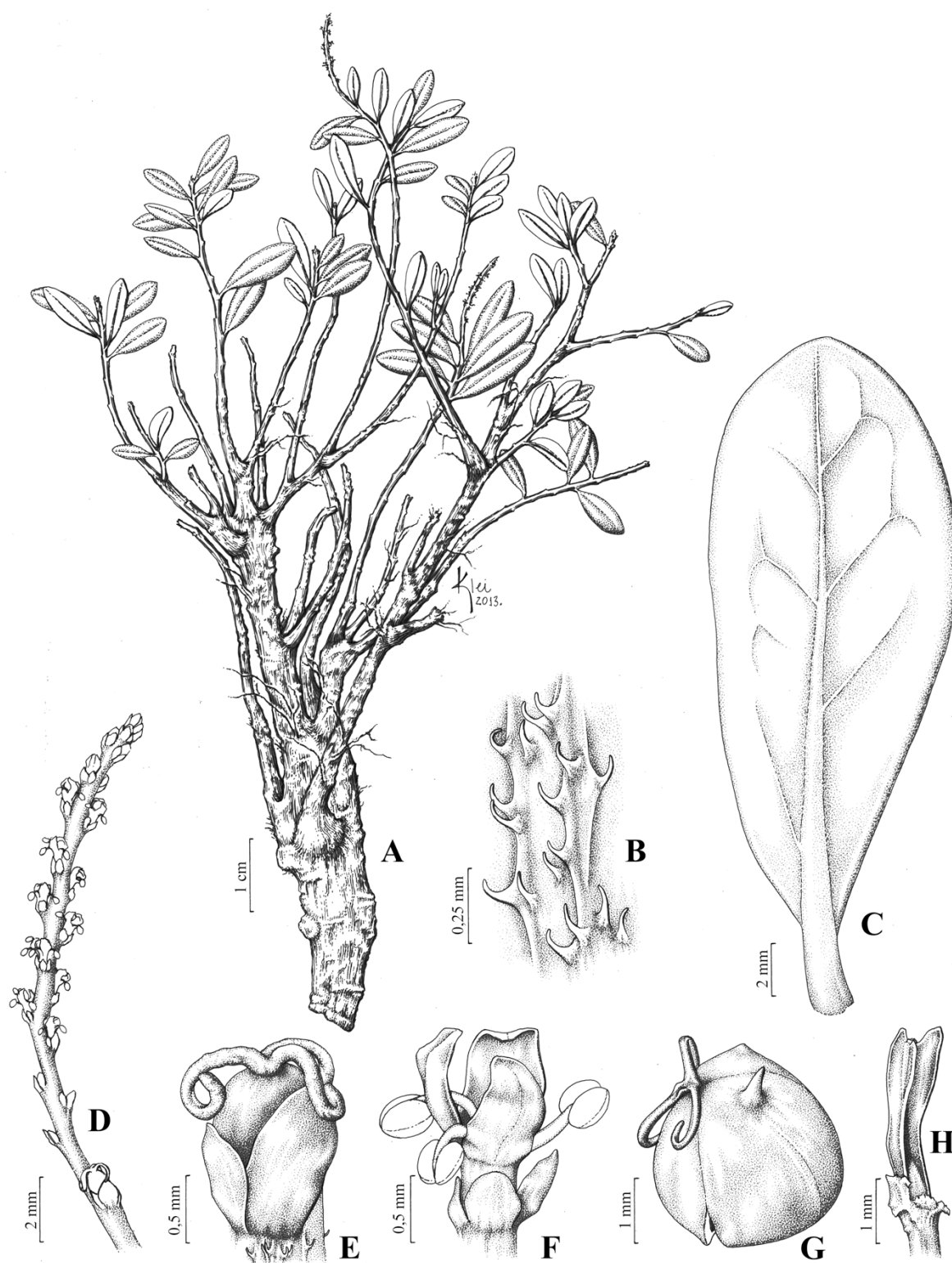


Figure 1. *Microstachys liliputiana*. A. Habit. B. Detail of the indumentum. C. Fleshy leaf. D. Inflorescence. E. Female flower. F. Male flower. G. Fruit. H. Columella.



Figure 2. *Microstachys liliputiana*. A. Habit. B. Root system. C. Inflorescence. D. Fruit. (MJ. Silva).

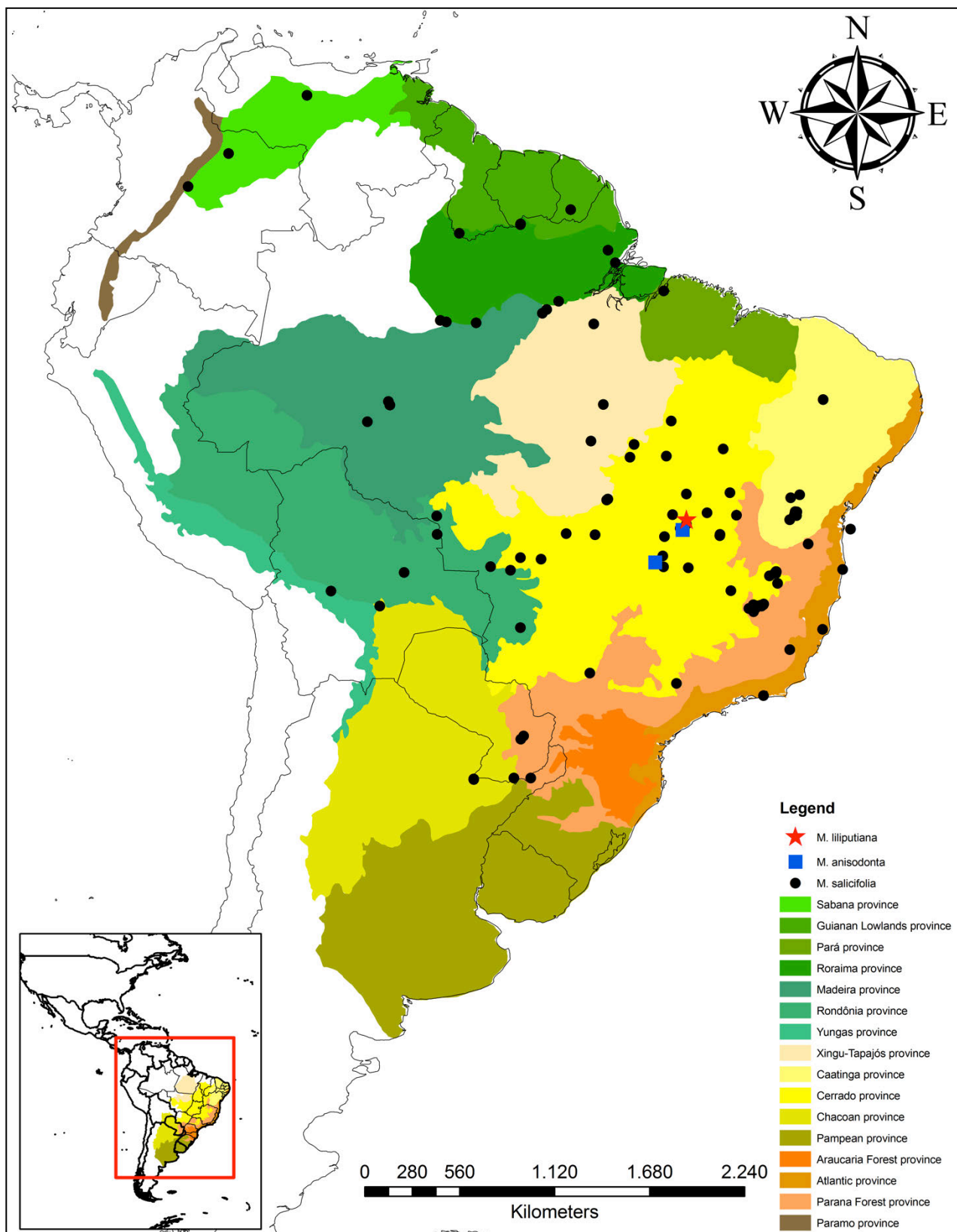


Figure 3. Distribution map of *Microstachys anisodonta*, *M. liliputiana* and *M. salicifolia*.

Microstachys anisodonta (Müll.Arg.), M.J. Silva and Pscheidt stat. nov.

Basionym: *Sebastiania anisodonta* Müller Argoviensis (1874 p. 550).

Type: BRAZIL. Goiás, Serra D'Ourada, without date, *Pohl 1555* (holotype: M!; isotype: W!).

Sebastiania anisodonta was described by Müller Argoviensis based in a single collection of Serra Dourada region in Goiás State in Brazil. Govaerts et al. (2000) indicated this species as belonging to *Microstachys*, but without any morphological notes.

When we studied the collection of *Pohl 1555* we noted that this belongs to the genus *Microstachys* based on its inflorescences opposite to the leaves, ovary and fruit with spine-like appendages and carunculated seeds. The species differ from others *Microstachys* by the decumbent habit, smaller and more delicate inflorescences, lustrous dark-green leaves, and margin with adpressed teeth in proximal view and curved in distal view.

According to Müller (1874) this species is endemic to Goiás and in our field trips we did not find any specimen growing outside of the Parque Nacional da Chapada dos Veadeiros (Fig. 3).

Vouchers: BRAZIL. Goiás, Alto Paraíso de Goiás, Parque Nacional da Chapada dos Veadeiros, 24.III.1971, *H.S. Irwin et al.* 33098 (K, NY); Estrada para Cavalcanti, 08.II.1987, *S. Romaniuc Neto 613* (MG, SP); Cerca de 2,8 Km a partir da bifurcação da entrada que leva a Cachoeira das Sete Quedas., 14°07'30"S 47°44'24.05" W, 1158 m, 14.XII.2013, *M. J. Silva et al.* 5671, 5672 (UFG); Cavalcante, Parque Nacional da Chapada dos Veadeiros, em direção ao morro Peito de Moça, cerrado rupestre, 14°05'49.9" S 47°45'05.09" W, 1153 m, 03.VIII.2013, fl., *M.J. Silva et al.* 5236 (UFG); Pouso Alto, Parque Nacional da Chapada dos Veadeiros, Entrada da cruz, 13°57'45.01"S 47°30'02.04"W, 1536 m, 21.I.2012, *Pscheidt et al.* 123 (SP); Veadeiros, Parque Nacional da Chapada dos Veadeiros, 14.II.1966, *Irwin et al.* 12846 (K, NY).

Microstachys salicifolia (Martius and Zuccarini), M.J. Silva and Pscheidt stat. nov.

Basionym: *Cnemidostachys salicifolia* Martius and Zuccarini (1824b p. 70) ≡ *Sebastiania corniculata* fo. *salicifolia* (Mart. and Zucc.) Müller Argoviensis (1866 p. 1171) ≡ *Sebastiania corniculata* var. *salicifolia* (Mart. and Zucc.) Müller Argoviensis (1874 p. 556) ≡ *Sebastiania salicifolia* (Mart. and Zucc.) Pax, Pax and Hoffmann (1912 p. 103) ≡ *Sebastiania salicifolia* var. *genuina* Pax, Pax and Hoffmann (1912 p. 104), *nom. inval.*

Type: BRAZIL. Minas Gerais, 1835, *Martius s.n.* (holotype: M!; isotypes: E!, M!).

Cnemidostachys salicifolia was recognized as synonym of *Sebastiania corniculata* Vahl for

a long time, first by Müller Argoviensis (1866, 1874) and followed by Pax and Hoffmann (1912). After the reestablishment of *Microstachys* by Esser (1998), this species remained as synonym of *Microstachys corniculata* (Vahl) Griseb. (Govaerts et al. 2000), corroborating with a polymorphic view of *M. corniculata*. Despite the real plasticity of *Microstachys corniculata*, according to field observations, branches of *M. salicifolia* are long, stiff but flexuous in the endings, whereas the branches of *M. corniculata* are shorter and decumbent. They also differ by leaf base, which is rounded in *M. salicifolia* and cordate in *M. corniculata*.

Some morphological variations of this species may confuse them with *Microstachys bidentata*, but the falcate leaves and cylindrical and revolute stigmas of *M. salicifolia* differ from the linear leaves and globose and erect stigmas of *M. bidentata*.

Microstachys salicifolia has a wide distribution in Brazil: occurs in the Northeast, Midwest and Southeast areas. The species grows in Atlantic Florest, Caatinga, Cerrado, Chacoan, Guianan Lowlands, Madeira, Pará, Parana Forest, Rondônia, Roraima, Sabana and Xingu-Tapajós phytogeographic provinces, often in rocky grasslands, on sandy or sandy clay soils.

Vouchers: BRAZIL. Goiás: Alexânia, KM 78 da BR-060 sentido Anápolis, 25°00'S 55°55'W, 1000 m, 13.XII.1982, *W. Hahn et al.* 870 (MO, SP); Alto Paraíso de Goiás, Parque Nacional da Chapada dos Veadeiros, 13°15'S 41°53'W, 1200 m, 28.XII.1991, *R.M. Harley et al.* 50526 (CEPEC, HUFS, K, SP, SPF); Cerca de 1 km a Noroeste do Morro do Buracão, 14°06'32,04"S, 47°44'01.05"W, 1162 m, 10.V.2013, *P. H. B. Santos et al.* 01, 02 (UFG); Cavalcante, cerca de 4,5km da Vila Veneno em direção a São Félix, 13°32'S 41°54'W, 1250 m, 17.XII.1988, *R.M. Harley et al.* 25585 (SP); Colinas do Sul de Goiás, entrada para a Fazenda Gavião, 14°09'52.0"S 47°52'48.04"W, 520 m, 1.XI.2013, *P. H. B. Santos et al.* 80 (UFG); Niquelândia, Oeste da Serra Negra, 16°37'S 42°56'W, 850 m, 12.X.1988, *R.M. Harley et al.* 25038 (SP); São Jorge, Cachoeira do Abismo, 13°34'44"S 41°50'28"W, 18.XI.1996, *R.M. Harley et al.* 4452 (ALCB, K, SP); 13°36'18"S 41°46'22"W, 1020 m, 20.IV.2009, *R.M. Harley* 55959 (HUEFS, SP); Serra Dourada, 27.XI.1984, *R.M. Harley et al.* 6503 (SP, SPF).

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CONSIDERAÇÕES FINAIS

No presente trabalho foram encontradas algumas dificuldades técnicas para a extração e amplificação dos marcadores moleculares nas espécies estudadas. Inicialmente objetivamos por estudar a filogenia da tribo Hippomaneae com acessos dos principais gêneros neotropicais coletados no Brasil em diversas expedições botânicas realizadas entre 2011 a 2014, contudo, frente às dificuldades encontradas, reduzimos os acessos para os gêneros relacionados com *Microstachys*.

Estas dificuldades durante a elaboração da filogenia também prejudicaram a amostragem interna em *Microstachys*, uma vez que, apesar de ter obtido sucesso na extração de DNA e amplificação de sequências para as espécies extra-neotropicais, estas sequências não apresentaram qualidade suficiente para serem utilizadas na filogenia. Entretanto, a maior diversidade do gênero é encontrada na região Neotropical, especialmente nas províncias da Caatinga e do Cerrado, e tal diversidade pôde ser amostrada de forma suficiente.

Na delimitação das espécies, foi de grande importância o período de doutorado sanduíche realizado na Europa, tendo como base o herbário M (Munique, Alemanha) e visita aos herbários K (Kew, Reino Unido) e P (Paris, França) além do empréstimo para Munique de material de outros herbários do mundo. Com isso, 99% dos materiais-tipos foram estudados e a identidade taxonômica das espécies reconhecidas. A grande quantidade de sinônimos, do histórico de mudança de status do gênero *Microstachys*, além das espécies novas evidenciadas nas coleções estudadas e nas coletas a campo, demonstram a grande importância do gênero na biodiversidade neotropical e o pouco conhecimento a seu respeito.

A análise de padrões geográficos das espécies e da diversificação de *Microstachys* trouxe resultados interessantes: cinco espécies endêmicas das províncias do Cerrado (*M. anisodonta*, *M. liliputiana* e *M. nummularifolia*) e da Caatinga (*M. revoluta* e *M. uleana*), todas elas classificadas com Criticamente Ameaçadas pelos critérios da IUCN, atestam a importância destes ambientes ao longo da diversificação do gênero e chama a atenção para a necessidade de conservação deles, em especial dos campos rupestres, onde tais espécies são encontradas.

Outras três espécies, *M. dasycarpa*, *M. nana* e *M. stipulacea*, são, cada uma, endêmicas de outras províncias (Chaco, Floresta de *Araucaria* e Pampas, respectivamente) e em *M. heterodoxa* é observado um padrão disjunto entre campos rupestre e restinga, já relatado para outras Angiospermas. Sete outras espécies (*M. crotonoides*, *M. daphnoides*, *M. ditassoides*, *M. glandulosa*, *M. hispida*, *M. marginata*, e *M. serrulata*) possuem distribuição restrita, ocorrendo em campos rupestres, formações de cerrado e restingas ao longo das demais províncias da subregião do Chaco.

As hipóteses filogenéticas apresentadas aqui confirmam o monofiletismo de *Microstachys* e apresentam dois clados neotropicais, um formado, em sua maioria, por espécies de ampla distribuição e com morfologia homogênea, e outro contendo a maioria das espécies endêmicas, que apresentam morfologia bastante heterogênea. Entretanto, possíveis sinapomorfias morfológicas não foram encontradas para cada um destes clados.

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