



LÍVIA LARA ALVES

**MALPIGHIACEAE NA SERRA DO LENHEIRO, *BYRSONIMA*
NO ESTADO DO ESPÍRITO SANTO E *BYRSONIMA* DE
FLORES ROSAS E BRANCAS NA CADEIA DO ESPINHAÇO**

LAVRAS-MG

2021

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DO ESPINHAÇO**

Tese apresentada à Universidade Federal de Lavras, como parte das exigências do Programa de Pós-Graduação em Botânica Aplicada, área de concentração Taxonomia Vegetal, para obtenção do título de Doutor.

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Lavras - MG

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**MALPIGHIACEAE FROM LENHEIRO MOUNTAIN RANGE, *BYRSONIMA* FROM
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RESUMO

A primeira parte da tese consta de uma introdução geral sobre a família Malpighiaceae Juss. e sobre o gênero *Byrsonima* Rich. ex Kunth. A segunda parte é apresentada em formato de artigos. O primeiro artigo apresenta um trabalho da flora de Malpighiaceae na Serra do Lenheiro, estado de Minas Gerais, um tratamento taxonômico para esta região localizada a nordeste do centro urbano da cidade de São João del-Rei. Esta região é caracterizada por dois domínios fitogeográficos: Cerrado e Floresta Atlântica. Foram registradas para a região 23 espécies e nove gêneros de Malpighiaceae, sendo o gênero com maior número de espécies *Byrsonima*. Sendo assim, para os próximos artigos foram realizados trabalhos taxonômicos para áreas de grande diversidade de espécies para os dois domínios fitogeográficos presentes para a Serra do Lenheiro, assim como opção pelo gênero de maior ocorrência nessa área de estudo. O segundo artigo apresenta tratamento taxonômico para o gênero *Byrsonima* para o estado do Espírito Santo. A Floresta Atlântica do estado do Espírito Santo apresenta a maior diversidade de espécies do gênero *Byrsonima* neste domínio fitogeográfico. Foram registradas para a região 17 espécies. O terceiro artigo apresenta tratamento taxonômico das *Byrsonima* de flores rosas e brancas para a Cadeia do Espinhaço, que se estende na direção sul-norte do Quadrilátero Ferrífero, no centro de Minas Gerais, para a Chapada Diamantina, no estado da Bahia. Ela é uma cadeia de montanhas que se estende por 1200 Km. Foram registradas 20 espécies de *Byrsonima* de flores rosas e brancas para a região.

Palavras-chave: Floresta Atlântica. Cerrado. Clado Byrsonimoids.

ABSTRACT

The first part of the work consists of a general introduction about the Malpighiaceae Juss family and about the *Byrsonima* Rich genus. ex Kunth. The second part is presented in article format. The first article presents a work on the flora of Malpighiaceae in Serra do Lenheiro, state of Minas Gerais, a taxonomic treatment for this region located northeast of the urban center of the city of São João del-Rei. This region is characterized by two phytogeographic domains: Cerrado and Atlantic Forest. Twenty-three species and nine genera of Malpighiaceae were recorded for the region, being the genus with the highest number of species *Byrsonima*. Thus, for the next articles, taxonomic studies were carried out for areas of great diversity of species for the two phytogeographic domains present for Serra do Lenheiro, as well as the option for the most common genus in this study area. The second article presents a taxonomic treatment for the genus *Byrsonima* for the state of Espírito Santo. The Atlantic Forest in the state of Espírito Santo has the greatest diversity of species of the genus *Byrsonima* in this phytogeographic domain. 17 species were registered for the region. The third article presents a taxonomic treatment of *Byrsonima* with pink and white flowers for the Espinhaço Range, which extends from the south-north direction of the Quadrilátero Ferrífero, in the center of Minas Gerais, to the Chapada Diamantina, in the state of Bahia. It is a mountain range that extends for 1200 km. 20 species of *Byrsonima* with pink and white flowers have been recorded for the region.

Keywords: Atlantic Forest. Cerrado. Byrsonimoids clade.

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PRIMEIRA PARTE

1 INTRODUÇÃO GERAL

Malpighiaceae Juss. é uma das 36 famílias atualmente incluídas na ordem Malpighiales (APG IV 2016). A família compreende 77 gêneros e ca. 1300 espécies de árvores, arbustos e lianas, distribuídas nos trópicos de todo o mundo, mas predominantemente nos Neotrópicos (Davis & Anderson 2010).

No Brasil, Malpighiaceae é representada por 46 gêneros e ca. 588 espécies, ocorrendo em todas as regiões e domínios fitogeográficos do país (Almeida et al. 2020). Os domínios do Cerrado e Amazônia contêm a maior diversidade da família (ca. 239 e 234 espécies respectivamente), seguido pelo domínio da Floresta Atlântica (214 espécies), Caatinga (102 espécies), Pantanal (29 espécies) e Pampa (8 espécies) (Almeida et al. 2020).

Mesmo sendo umas das famílias com maior representatividade nos domínios fitogeográficos do Brasil, poucas espécies fazem parte do cotidiano dos brasileiros. Embora algumas espécies sejam cultivadas como ornamentais (*Galphimia brasiliensis* (L.) A.Juss.), o efeito decorativo da floração (flores com cores chamativas) e frutificação (frutos abundantes, coloridos e duradouros) da maioria das espécies de Malpighiaceae ainda é subutilizada (Souza & Lorenzi 2005). Por outro lado, existem espécies que têm importância na fruticultura, as mais comuns são a acerola (*Malpighia emarginata* DC.) e os muricis (*Byrsonima* spp.), cujos frutos são apreciados na alimentação humana, podendo ser consumidos *in natura* ou cristalizados, na forma de geleias, sorvetes, iogurtes, refrescos e licores (Soares 2012).

A família é facilmente reconhecida por seus tricomas unicelulares (malpighiáceos) em formato de T, Y e V, por suas sépalas com duas glândulas secretoras de óleos (elaióforos) na face abaxial de todas as cinco sépalas ou das quatro sépalas laterais, e por suas pétalas unguiculadas (Anderson 1981).

O estado de Minas Gerais é o segundo mais diverso do país em espécies de Malpighiaceae, com 205 espécies (Almeida et al. 2020). A riqueza da flora mineira está diretamente associada ao seu relevo acidentado, variedade de solos e climas, onde as formações serranas campestres guardam grande parte da diversidade biológica do estado (Giulietti et al. 1987). Dentro dessa biodiversidade, destaca-se histórica e biogeograficamente dentre as serras do estado de Minas Gerais, a Serra do Lenheiro, que foi cenário importante na conquista e povoamento do estado e área de transição entre dois domínios fitogeográficos: Floresta Atlântica e Cerrado (Tavares 2011; Vasconcelos 2011).

Nesse contexto, o trabalho da flora de Malpighiaceae para a Serra do Lenheiro (Artigo 01) irá trazer uma contribuição importante para o conhecimento da diversidade da família, da distribuição das espécies encontradas, além da visibilidade da área de estudo em relação à localização, história e preservação da mesma.

Os artigos 2 e 3 referem-se a um dos maiores gêneros de Malpighiaceae, *Byrsonima* Rich. ex Kunth, com aproximadamente 159 espécies exclusivamente neotropicais (IPNI 2021). O país com o maior número de espécies de *Byrsonima* é o Brasil, com 99 espécies, com os domínios do Cerrado e Amazônia, contendo a maior parte da diversidade (ca. 50 espécies), seguidos pela Floresta Atlântica com ca. 27 espécies (Francener 2020).

As espécies de *Byrsonima* são reconhecidas por seu hábito arbustivo ou arbóreo, inflorescência terminal, ereta, com flores em cincinos geralmente unifloros, cálice geralmente com dez elaióforos, estes raramente ausentes, ausência de nectários extras-florais, androceu com dez estames, pétalas alvas, amarelas ou rosas, glabras, três estiletos subulados e frutos do tipo drupa (Anderson 1995; Mamede 1987).

Niendenzu (1897) dividiu o gênero em dois subgêneros baseado no tamanho do conectivo em relação ao tamanho das tecas das anteras. A maioria das espécies de *Byrsonima* subg. *Macrozeugma* Nied. possuem flores brancas e rosas, conectivos dos estames desenvolvidos, excedendo o ápice das tecas das anteras em mais de um quarto de seu comprimento, enquanto *Byrsonima* subg. *Byrsonima* Nied. possuem flores com pétalas amarelas e conectivos que usualmente não excedem as tecas das anteras ou excedem em menos de um quarto de seu comprimento.

Para o domínio da Floresta Atlântica estudou-se o estado do Espírito Santo, pois o mesmo possui a maior diversidade de espécies de *Byrsonima* neste domínio fitogeográfico (Simonelli & Fraga 2007), tendo como objetivos atualizar a lista das espécies encontradas no estado. São apresentadas descrições morfológicas, fotos e distribuição geográficas das espécies.

Para o domínio do Cerrado, a Cadeia do Espinhaço pode ser considerada uma área de grande diversidade, com ca. 40 espécies de *Byrsonima*, dessas, 20 são de flores rosas ou brancas, sendo 16 pertencentes a *Byrsonima* subg. *Macrozeugma* (todas as pétalas rosas ou brancas) e quatro pertencentes a *Byrsonima* subg. *Byrsonima* (pétalas laterais rosas ou brancas e pétala posterior amarela). Devido a esse grande número de espécies a chave taxonômica e as descrições morfológicas serão de grande ajuda na identificação das espécies encontradas.

2 REFERENCIAL TEÓRICO

2.1 A importância da pesquisa básica no desenvolvimento da ciência e em Malpighiaceae

A taxonomia é a ciência da identificação, descrição, nomenclatura e classificação dos seres vivos (Francisco 2018). Talvez, a mais velha de todas as ciências, pois nasceu com o homem, mas, com toda certeza, a mais necessária (Bicudo 2004). Identificar não é simples, é somar conhecimento, é realizar primeiro uma profunda análise para, só depois, efetuar a síntese desse conhecimento e chegar a um nome. O taxonomista jamais aplica, ele conclui o nome (Bicudo 2004).

Os estudos taxonômicos são o ponto inicial de muitos outros estudos científicos, pois a Taxonomia é uma ciência básica, isto é, fornece a base para que outras ciências possam ser aplicadas, como estudos de conservação, ecológicos, evolutivos e de interesse econômico (ex.: farmacêutico, agrônomo, extrativista, médico) (Francisco 2018). Sem a taxonomia não se pode saber quais espécies foram extintas, quais estão ameaçadas de extinção, qual tipo de equilíbrio existe no interior da comunidade que habita uma área e por que reina esse equilíbrio; qual o custo da biodiversidade de uma dada área; o que acontecerá com o equilíbrio biológico de uma área se as condições ambientais que a governam forem alteradas etc. Enfim, nada disso será possível se não existirem taxonomia e taxonomistas (Bicudo 2004).

Em Malpighiaceae, a taxonomia é essencial para a separação dessa família em grandes ou pequenos grupos, como gêneros ou espécies. O estudo de Malpighiaceae é dificultado principalmente devido ao grande número de representantes e sinônimas (Anderson 2001).

A família possui a arquitetura floral muito similar, esse caráter conservativo torna a identificação em espécies mais complexa, levando os taxonomistas a recorrerem por caracteres como frutos ou indumento, dentre outras características, sendo assim, fundamental para a realização desse trabalho (Anderson 1979; Mamede 1981).

2.2 Taxonomia e Morfologia de Malpighiaceae

Possuem representantes como árvores, arbustos, subarbustos ou lianas, folhas simples e opostas, estipuladas, possuindo tricomas malpighiaceos em forma de T, Y ou V. Podem

possuir glândulas foliares e peciolares. Exibem arquitetura floral bilateral, cinco sépalas fundidas na base, em geral biglandulosas ou podem estar ausentes; cinco pétalas unguiculadas, de coloração alva, amarela ou rósea. Androceu composto por dez estames conados, anteras glabras ou pilosas, de deiscência rimosa e conectivos bem desenvolvidos. Gineceu de ovário súpero, tricarpelar e trilocular, três estiletos. Os frutos nos arbustos e árvores variam, a maioria é não alado, seco ou carnoso. Nas lianas em sua maioria são alados, compostos por três sâmaras, onde os gêneros podem ser diferenciados pela estrutura e posição da asa das sâmaras (baseada em Anderson, 1981, 2001, 2004 e Mamede 1987).

De acordo com Davis et al. (2001), Malpighiaceae é dividida em dois grandes grupos, sendo um deles a subfamília Byrsonimoideae, presente no Novo Mundo, e o outro maior, Malpighioideae, contendo as demais espécies da família, que se distribuem tanto no Novo Mundo como no Velho Mundo.

2.2.1 História taxonômica de Malpighiaceae

Em 1753, o naturalista sueco Carolus Linnaeus (1707 – 1778), listou em sua obra "Species plantarum", espécies agora incluídas na família Malpighiaceae em uma categoria que ele chamou de "Decandria Trigynia", que seriam as espécies que possuíam dez estames e três estiletos. Ele os atribuiu a três gêneros: *Banisteria* (frutos divididos em três sâmaras, cada uma com uma grande asa dorsal), *Malpighia* (frutos carnosos) e *Triopterys* (frutos divididos em três sâmaras, cada uma com uma asa lateral com três lobos). Na segunda edição de sua obra, em 1762, ele acrescentou *Thryallis* (fruto dividido em três cocos). Ele assumiu erroneamente que *Thryallis* tinha apenas um estilete e, portanto, a colocou na categoria "Decandria Monogynia".

Em 1789, Antoine Laurent de Jussieu (1748 – 1836), em sua obra "Genera plantarum", atribuiu gêneros a ordens, que são equivalentes às famílias de hoje. Ele colocou os três gêneros descritos por Linnaeus: *Banisteria*, *Malpighia* e *Triopterys*, em sua ordem "Malpighiae", agora a família Malpighiaceae. Como Linnaeus, ele não viu espécimes de *Thryallis*. Como a descrição de Linnaeus afirmou erroneamente que apenas um estilete está presente, Jussieu listou "*Thryallis*" na ordem "Acer", mas como intermediário para as "Malpighiae" e observou que diferia delas apenas na presença de um estilete único, em vez de três estiletos (Jussieu 1789). *Malpighia* ainda é um gênero aceito. O nome *Thryallis* foi conservado, mas usado para outros grupos de espécies, que não possuem elaióforos e com

tricomas estrelados (*Thryallis* Mart.). E o nome *Banisteria* é agora sinônimo de *Banisteriopsis* (Gates 1977).

Linnaeus utiliza-se de uma taxonomia para plantas com flores chamada de "sistema sexual", na qual os gêneros são agrupados estritamente pelo número e arranjo dos estames e pelo número de estiletos. O "sistema sexual" foi amplamente adotado, porque forneceu pela primeira vez uma classificação preditiva. Finalmente, foi substituído pelo "sistema natural", proposto de maneira mais convincente por A. L. de Jussieu em 1789 na obra "Genera plantarum" (Linnaeus 1753; Jussieu 1789).

Na Espanha, nesse período, o botânico Antonio José Cavanilles (1745 – 1804) contribuiu amplamente para as Malpighiaceae, publicando nos fascículos 8 (1789) e 9 (1790) de suas "Monadelphiae classis dissertationes decem" e nos volumes 5 (1799) e 6 (1801) de seus "Icones et descriptiones plantarum". Ele propôs os gêneros *Flabellaria*, *Galphimia*, *Molina* (= *Hiptage*) e *Tetrapterys* (Cavanilles 1785-90, 1791-1801).

Em Paris, o alemão Carl Kunth (1788 – 1850), produziu os sete volumes de "Nova genera et species plantarum" (1815-1825), um trabalho de referência na botânica do Novo Mundo. Em seu tratamento das Malpighiaceae (Kunth 1822: 145-174) descreveu muitas novas espécies e propôs quatro novos gêneros (*Bunchosia*, *Byrsonima*, *Gaudichaudia* e *Heteropterys*).

O botânico suíço A. P. de Candolle (1778 – 1841) iniciou o "Prodromus", um trabalho destinado a ser um relato em nível de espécie da flora do mundo. Ele escreveu a maioria dos sete primeiros volumes. Após sua morte seu filho Alphonse continuou a série, como autor e editor de tratamentos por especialistas, por mais 10 volumes. O estudo de A. P. de Candolle sobre as Malpighiaceae no volume 1 (1824) do "Prodromus" formou a base para futuros estudos sobre a família, especialmente a primeira monografia da família por Adrien de Jussieu. Candolle reconheceu 16 gêneros, distribuídos em três tribos - Tribo Malpighieae: *Malpighia*, *Byrsonima*, *Bunchosia*, *Galphimia*, *Caucanthus*; Tribo Hiptageae: *Hiptage*, *Tristellateia*, *Thryallis*, *Gaudichaudia*, *Camarea*; Tribo Banisterieae: *Hiraea*, *Triopterys*, *Tetrapterys*, *Banisteria*, *Heteropterys* (Candolle 1824).

Adrien de Jussieu (1797 – 1853) sucedeu seu pai, A. L. de Jussieu, e em seu artigo "Malpighiacearum synopsis" (1840) incluiu novos gêneros e muitas novas espécies e preparou o cenário para a primeira monografia da família "Monographie des Malpighiacées" (1843). Jussieu avaliou os limites dos gêneros e descreveu 19 novos gêneros, baseados em novas coleções ou discernidos de gêneros definidos muito amplamente: *Aspidopterys*,

Brachypterys (= *Stigmaphyllon*), *Burdachia*, *Coleostachys*, *Dinemagonum*, *Dinemandra*, *Diplopterys*, *Echinopterys*, *Heladena*, *Janusia*, *Jubelina*, *Lophanthera*, *Lophhanthera*, *Peixotoa*, *Pterandra*, *Ryssopterys*, *Spachea* e *Verrucularia* (Jussieu 1840, 1843).

O botânico alemão August Grisebach (1814 – 1879) fez sua primeira publicação sobre Malpighiaceae em seu artigo "Malpighiacearum brasiliensium centuriam" (1839), no qual descreveu muitas novas espécies (Grisebach 1839). Seu trabalho mais influente na família foi o estudo da "Flora Brasiliensis" de Martius (Grisebach 1858). Ele apresentou trabalhos adicionais sobre Malpighiaceae em sua "Flora das Ilhas Britânicas das Índias Ocidentais Britânicas" (1859-1864), "Plantae wrightianae" (1860-62), "Catalogus plantarum cubensium" (1866), "Plantae lorentzianae" (1874), e "Symbolae ad floram argentinam" (1879). Grisebach propôs os gêneros *Blepharandra*, *Dicella*, *Henlea* (= *Henleophytum*), *Malacmaea* (= *Bunchosia*) e *Mionandra* (Grisebach 1859-64, 1860, 1866, 1874 e 1879).

O botânico alemão Franz Niedenzu (1857 – 1937) publicou várias monografias e documentos genéricos sobre tópicos relacionados e escreveu o tratamento de Malpighiaceae para "Die natürlichen Pflanzenfamilien" (1888–1894, 1897, 1906). Seus estudos culminaram na segunda monografia das Malpighiaceae em "Das Pflanzenreich" (1928). Niedenzu descreveu muitas espécies novas e seis gêneros: *Alcoceratothrix* (= *Byrsonima*), *Callyntranthele* (= *Blepharandra*), *Cordobia*, *Diaspis*, *Malpighiodes* e *Sprucina* (= *Jubelina*) [Niedenzu 1888-94, 1897, 1906 e 1928].

José Cuatrecasas (1903 – 1996) preparou o tratamento para sua "Prima Flora Colombiana" (1958), que revelou a riqueza surpreendente da família na Colômbia. Ele reconheceu 168 espécies (em 21 gêneros), muitas delas recém-descritas ou suas circunscrições alteradas. Seus dois novos gêneros, *Atopocarpus* e *Skoliopterys*, agora estão incluídos em *Heteropterys*. Cuatrecasas contribuiu com artigos adicionais sobre Malpighiaceae e, com o co-autor T. B. Croat, escreveu em 1981 o relato da família para a Flora do Panamá (Cuatrecasas 1958, Cuatrecasas & Croat 1981).

O americano William R. Anderson (1942 – 2013) desenvolveu monografias e revisões taxonômicas, descrições de novos gêneros e espécies, contribuições em floras, combinações nomenclaturais, estudos de biologia reprodutiva, análise de cariótipo e estudos filogenéticos. Publicou mais de 80 artigos científicos e muitas contribuições em vários projetos florísticos do Arizona (EUA) ao Uruguai. Seu trabalho mais recente foi em 2013, "Origins of Mexican Malpighiaceae", ano de seu falecimento (Elizondo 2014).

Atualmente, o trabalho da Flora do Brasil 2020 reúne informações para a identificação das plantas nativas do Brasil. Até então a obra que reunia este tipo de informação era a Flora Brasiliensis iniciada por Martius em 1840 e concluída por seus colaboradores em 1906, ou seja, há 115 anos. A Flora do Brasil_2020 reúne, em uma plataforma online, toda informação e imagens das plantas, algas e fungos brasileiros descritos pelos cientistas até o momento. Os pesquisadores Maria Cândida Henrique Mamede, André Amorim, Renata Sebastiani, Cleiton Pessoa, Rafael Felipe de Almeida e Augusto Francener contribuem para o estudo da família Malpighiaceae.

2.3 Importância econômica das Malpighiaceae

As Malpighiaceae possuem uma importância econômica discreta. No uso alimentício, temos o popular aceroleiro (*Malpighia emarginata* DC.), rico em vitamina C (Anderson 2004) e algumas espécies de *Byrsonima*, cujo fruto são utilizados *in natura* ou na fabricação de sorvetes e geleias (Rego e Albuquerque 2006).

Além da alimentação, estudos vêm revelando a importância do gênero *Byrsonima* para o tratamento de doenças (ver seção “Importância das *Byrsonima*”). Além disso, representantes da família apresentam uso ornamental, como *Lophantera lactescens* Ducke, representa uma das árvores mais ornamentais do Brasil (Souza & Lorenzi 2005). *Heteropterys byrsonimifolia* A. Juss. não é usada somente como planta ornamental, mas também como afrodisíaco (Silva-Júnior 2012). *Banisteriopsis caapi* (Spruce ex Griseb.) Morton, é um potencial alucinógeno, utilizado na preparação de uma bebida que provoca visões multicoloridas pelas populações nativas na Floresta Amazônica (Anderson 2004), sendo amplamente usado por grupos religiosos (Oliveira et al. 2020). Pode-se citar ainda, os estudos de algumas espécies dos gêneros *Banisteriopsis*, *Heteropterys* e *Malpighia* em pesquisas de fármacos para o combate ao câncer e ao mal de Parkinson (Schwarz et al. 2003), enquanto outros estudos investigam o grau de toxidez e atividade antiviral de espécies do gênero *Tetrapteryx* Cav. (Melo et al. 2001). Em estudos com *Bunchosia armenica* (Cav.) DC. foi relatada atividade anti-inflamatória frente aos micro-organismos *Staphylococcus aureus*, *Escherichia coli* e *Pseudomonas aeruginosa* (Queiroz et al. 2015).

2.4 Taxonomia e Morfologia de *Byrsonima*

Byrsonima é um gênero que possui plantas predominantemente arbóreas, mas podemos destacar também o hábito arbustivo e subarbustivo em áreas savânicas, como o Cerrado brasileiro e o Planalto das Guianas (Anderson 1981).

As estípulas em *Byrsonima* são intrapeciolares, geralmente esse par é conado, mas em algumas espécies pode ser parcialmente conadas ou livres. Seu formato também é utilizado na delimitação de espécies e se são decíduas ou não. A morfologia foliar é importante para a caracterização de espécies, podendo-se destacar especialmente a forma das folhas que é importante para algumas espécies ou bastante variável, especialmente em espécies de ampla distribuição. As nervuras laterais também podem ser utilizadas, sendo broquidódromas, o seu número e o padrão das nervuras secundárias e terciárias é importante. O comprimento do pecíolo é também útil, o mais comum é ausente, com a lâmina foliar decorrente (atenuado) ou cuneado. A margem foliar e a base da folha também podem ser utilizadas na separação de espécies próximas. Um dos caracteres mais importantes é o indumento foliar, e a forma dos tricomas malpighiáceos. São tricomas unicelulares com duas trabéculas e um pedúnculo (base). O comprimento do pedúnculo e das trabéculas definem os diferentes tipos e densidades de indumentos presentes em *Byrsonima*: tomentoso, velutino ou seríceo, definindo as formas básicas de Y, T e V, mais raramente estrelados ou não ramificados. Segundo Anderson (1981) indumento seríceo é formado por tricomas sedosos, com trabéculas retas e mais ou menos sésseis. Velutino, indumento formado por tricomas eretos, paralelos e forma de Y ou V e tomentoso o indumento formado por tricomas eretos, com trabéculas enroladas e não paralelas. Além disso, o indumento pode variar num mesmo órgão (p. ex. folhas) ou em diferentes órgãos.

A inflorescência em *Byrsonima* é sempre terminal podendo ser dividida em tirso de cincinos unifloros, ou com até 4 flores, sendo uma característica útil na separação das espécies. As inflorescências também possuem tricomas e indumentos variados, ou podem ser completamente glabras. O comprimento da inflorescência, bem como a posição das flores na raque, são variáveis, e podem ser utilizados na identificação das espécies, especialmente a distribuição das flores por toda a raque, ou apenas na porção mediana e basal ou ainda apenas no ápice.

As flores podem apresentar pedicelos articulados (pedunculados) ou sésseis, pilosos ou glabros. O pedicelo e o pedúnculo podem ser circinados ou eretos e seu comprimento e espessura podem variar. As brácteas e bractéolas estão presentes na base dessas estruturas. Quando as flores são pedunculadas, o par de bractéolas emerge na base do pedicelo, e a bráctea na base do pedúnculo, mas nas flores sésseis as bractéolas emergem no mesmo nível da bráctea. Estas estruturas foram utilizadas por Niedenzu (1901) na delimitação de séries e seções. Geralmente são similares na forma, sendo a bráctea maior que as bractéolas, e podem ser glabras ou pilosas, e decíduas ou não na floração ou na frutificação.

O cálice é geralmente uniforme em *Byrsonima*, sendo as sépalas ovadas ou triangulares, com seu ápice revoluto ou ereto. Na frutificação, as sépalas podem ser concrecidas com o fruto, em algumas espécies adquirirão formatos linguiformes ou ainda serem carnosas. Na base das sépalas é comum a presença de um par de elaióforos, por sépala, podendo estar ausentes em algumas espécies, ou em alguns indivíduos de uma mesma população, característica presente em outros gêneros de Malpighiaceae.

A corola é formada por cinco pétalas com simetria zigomorfa, e cada pétala possui um limbo desenvolvido e uma base estreita denominada unguículo. A zigomorfia da corola é definida por uma pétala posterior, duas pétalas látero-anteriores e duas látero-posteriores. Aqui, preferimos chamar as pétalas látero-anteriores e as pétalas látero-posteriores de pétalas laterais, pois existe uma grande semelhança morfológica entre elas. A pétala posterior é geralmente ereta, com um limbo patente e unguículo mais espesso que a das pétalas laterais. As pétalas laterais apresentam unha deflexa e limbo cupuliforme ou plano. A coloração das pétalas é variável podendo ser todas róseas, brancas, ou amarelas, tornando-se róseo intenso, alaranjadas a avermelhadas com o tempo, ou apresentarem pétala posterior amarela e laterais róseas ou brancas. Nas pétalas, o indumento é uma característica rara, estando presente em apenas poucas espécies, como em *B. altissima*.

O androceu tem sempre dez estames, presentes em uma série ao redor do ovário. Os filetes são aplanados, geralmente com tricomas na base da face adaxial e face abaxial glabra. Além disso, os filetes podem ser conados ou não na base. Os tricomas são simples, podendo ser eretos ou sinuosos.

O conectivo apresenta morfologia variável, sendo o seu comprimento em relação às tecas importante para a separação de espécies. As espécies de flores róseas ou brancas, geralmente *Byrsonima* subg. *Macrozeugma*, usualmente possuem o conectivo desenvolvido, ultrapassando significativamente o ápice das tecas, normalmente em mais de ¼ de seu

comprimento, enquanto nas espécies de flores amarelas, geralmente *Byrsonima* subg. *Byrsonima*, o conectivo não ultrapassa o ápice das tecas em mais de $\frac{1}{4}$ de seu comprimento. A forma do conectivo é também variável, podendo ser cônica, obovoide ou globosa. Algumas espécies possuem o ápice do conectivo agudo, acuminado ou arredondado. Em algumas espécies podemos encontrar tricomas nos conectivos, mas a grande maioria é glabra. As anteras podem ser lineares ou oblongas com ápice das tecas arredondado, agudo, acuminado, mucronado ou caudado. Além disso, as tecas podem possuir projeções aladas lateralmente. A presença de tricomas também é importante, sendo glabras, ou então com tricomas seríceos, presentes entre as tecas ou então em sua lateral.

O gineceu é um caráter conservativo em *Byrsonima*. O estigma é sempre subulado e o estilete ereto, arqueado no ápice. O ovário apresenta indumento variável, podendo ser glabro ou seríceo. Os óvulos são anátropos e glabros. Os frutos são sempre drupas, que variam entre as espécies principalmente com sua coloração e tamanho. Quando maduros os frutos podem ser amarelos, vermelhos ou negros. O tamanho varia entre espécies. Além disso, o pedicelo pode variar no fruto maduro, podendo ser ereto, patente ou circinado. O formato possui pouca variação, podendo ser globosos ou ovoides (Francener 2016).

A filogenia da família Malpighiaceae (Davis & Anderson 2010), resultante de dados morfológicos e moleculares combinados, mostrou que grande parte dos gêneros mais diversos não eram monofiléticos, como já indicavam estudos anteriores (Cameron et al. 2001; Davis et al. 2001). Em decorrência disso, mudanças taxonômicas importantes na família já ocorreram e outras possivelmente acontecerão ao longo dos próximos anos. *Byrsonima* pertence à subfamília Byrsonimoideae e à tribo Byrsonimeae, sendo os últimos dois táxons considerados polifiléticos. O gênero *Byrsonima* é monofilético inserido dentro de um clado, chamado “Byrsonimoids”, com *Blepharandra* e *Diacidia* (Davis & Anderson 2010).

Dois subgêneros foram historicamente estabelecidos dentro do gênero: *Byrsonima* subg. *Byrsonima* e *Byrsonima* subg. *Macrozeugma* Nied., circunscrição baseada na morfologia dos estames (Niedenzu 1901). Grande parte das espécies de *Byrsonima* subg. *Macrozeugma* possuem flores alvas ou róseas e conectivos muito prolongados que ultrapassam as tecas da antera. Possuem distribuição predominantemente amazônica, com algumas espécies, como *B. triopteryfolia* A. Juss., *B. coccolobifolia* Kunth, *B. bahiana* W.R. Anderson e *B. cacaophila* W.R. Anderson, ocorrendo no Cerrado brasileiro e na Floresta Atlântica, enquanto outras, como *B. wadsworthii* Little e *B. trinitensis* A. Juss., ocorrendo nas Antilhas (Elias 2004). Por sua vez, *Byrsonima* subg. *Byrsonima* grande parte das espécies

possui flores amarelas e estames com conectivos que não ultrapassam as tecas da antera ou raramente os ultrapassam em até um quarto de seu comprimento. Esse subgênero possui distribuição predominantemente brasileira, com grande parte de suas espécies distribuindo-se pelo Cerrado.

Além disso, o gênero possui cinco seções: *Acrotheca*, *Colobotheca*, *Eriolepis*, *Kerozeugma* e *Sericolepis*, divididas de acordo com a morfologia dos estames e o indumento das brácteas e das folhas (Cuatrecasas 1958; Niedenzu 1901; 1928). As seções *Acrotheca*, *Colobotheca* e *Kerozeugma*, pertencem a *Byrsonima* subg. *Macrozeugma*, sendo que a sua separação está baseada especialmente na morfologia do ápice das anteras. As seções *Sericolepis* e *Eriolepis* pertencem a *Byrsonima* subg. *Byrsonima*, sendo separados especialmente pelo indumento das brácteas, bractéolas e folhas. As cinco seções ainda são divididas em subseções e séries.

Foram realizados trabalhos filogenéticos para *Byrsonima* com o objetivo de compreender sua relação com outros gêneros da família Malpighiaceae (Cameron et al. 2001; Davis et al. 2001; Davis & Anderson 2010). *Byrsonima* é monofilético, no entanto, nenhum trabalho foi publicado para entender as suas relações infragenéricas Davis & Anderson (2010), incluíram em sua análise nove terminais de *Byrsonima*. Apesar de representar uma amostragem insuficiente, uma vez que o gênero possui mais de 135 espécies aceitas (Anderson et. al. 2006), podemos inferir o polifiletismo de *Byrsonima* subg. *Macrozeugma* e *Byrsonima* subg. *Byrsonima*, os quais já haviam sido considerados como grupos artificiais por diversos autores (Cuatrecasas 1958; Anderson 1981; Mamede 1987; Elias 2004, Francener 2016).

2.4.1 História Taxonômica de *Byrsonima*

O nome *Byrsonima* surgiu pela primeira vez na literatura em uma obra de A.L. Jussieu (1811: 481), que o atribui a Louis Claude Marie Richard, que em seu estudo sobre frutos (1808: 24) afirma que o gênero *Malpighia* consistia de fato em três linhagens distintas, às quais ele não deu nome (Richard 1808).

A primeira diagnose do gênero foi elaborada em 1821 por Kunth no trabalho “*Nova Genera et Species Plantarum*” (Kunth 1822:145). Este autor aceitou a delimitação do gênero

proposta por Jussieu, assim como as combinações feitas por ele. Também fez combinações novas em quatro espécies, de *Malpighia* para *Byrsonima* e descreveu nove espécies novas.

Em 1832, Jussieu publicou mais 11 espécies novas no trabalho “*Flora Brasiliae Meridionalis*”, assim como uma descrição mais detalhada do gênero (Jussieu 1832).

Em 1839, Grisebach publicou mais cinco espécies novas de *Byrsonima* (Grisebach 1839). Um ano depois, Jussieu publicou em sua obra, “*Malpighiacearum Synopsis*”, 67 espécies de *Byrsonima* com descrições sucintas, sendo 30 espécies novas (Jussieu 1840). Este mesmo autor publicou a primeira monografia do gênero, em 1843, com descrições mais detalhadas (Jussieu 1843).

Em 1858, Grisebach publicou o primeiro trabalho com espécies exclusivamente brasileiras, das 55 espécies do trabalho, seis eram espécies novas (Grisebach 1858). Em 1875, este mesmo autor cita 17 espécies de *Byrsonima* em uma contribuição para a flora do Brasil Central, sendo uma espécie nova (Grisebach 1875).

Niedenzu, em 1896 apresentou em um volume da obra “*Die natürlichen Pflanzenfamilien*” uma pequena descrição do gênero, fazendo menção a 90 espécies de *Byrsonima* (Niedenzu 1896). Em 1897, este mesmo autor, dedicou a primeira parte de sua dissertação exclusivamente ao gênero *Byrsonima* (Niedenzu 1897).

Em 1901, Niedenzu publicou a segunda parte de sua dissertação sobre o gênero *Byrsonima*, da qual constam uma chave de identificação para 97 espécies, dentre estas 14 espécies novas. Também subdividiu o gênero em dois subgêneros, *Byrsonima* subg. *Brachyzeugma* (= *Byrsonima*, segundo Morton 1968) e *Byrsonima* subg. *Macrozeugma*, que foram por sua vez subdivididos em várias seções, subseções, séries e subséries (Niedenzu 1901). Em 1928, Niedenzu publicou um dos trabalhos mais completos para o gênero, com descrições e distribuição geográfica de todas as espécies conhecidas até aquele momento (Niedenzu 1928).

Posteriormente a essa data, novas espécies de *Byrsonima* foram publicadas por diversos autores: Standley (1930), Gleason (1931), Pilger (1937), Moldenke (1941), Sandwith (1943), Macbride (1949), Steyermark (1952), Little (1953), Cuatrecasas (1958), Lewis (1973), Mamede (1980), Anderson (1981, 1982, 1990, 1992, 1993, 1995, 1997, 1999, 2001), Francener et al (2017) e Rodrigues e Flores (2019). Porém, nenhum desses autores apresentou uma revisão completa do gênero.

2.5 Importância econômica das *Byrsonima*

As espécies de *Byrsonima* podem ter importância em diversas áreas. A mais conhecida seria sua importância na alimentação, os chamados “muricis” (*Byrsonima* spp.) possuem os frutos apreciados na alimentação humana, podendo ser consumidos de várias maneiras, *in natura* ou cristalizados, na forma de geleias, sorvetes, iogurtes, refrescos e licores (Rego & Albuquerque 2006; Soares 2012).

Algumas espécies de *Byrsonima* são amplamente usadas na medicina tradicional como tendo atividades antimicrobiana, antioxidante e anti-inflamatória (Guilhon-Simplicio & Pereira, 2011). Estudos demonstraram atividades anti-inflamatória e analgésica nas folhas de *Byrsonima duckeana* W.R.Anderson e na casca do caule de *Byrsonima japurensis* A.Juss., esta última, uma planta medicinal conhecida como “sara-tudo” na região da Amazônia brasileira (Guilhon-Simplicio et al., 2012; Guilhon-Simplicio et al., 2013; Guilhon-Simplicio et al.; 2017; Verdam et al., 2017). *Byrsonima crassifolia* (L.) Kunth é a espécie que possui a maior quantidade de trabalhos publicados, especialmente enfatizando o potencial farmacológico da planta. As propriedades farmacológicas de *B. crassifolia* já foram comprovadas em diversos estudos e pesquisas mais recentes confirmaram o poder antimicrobiano da planta, juntamente com seu efeito fotoquimioprotetor (Almeida 2018).

Byrsonima verbascifolia (L.) DC. também possui várias aplicações, é uma espécie largamente utilizada na medicina tradicional em diversas regiões do Brasil, para o tratamento de infecção, inflamação e diarreia (Panizza, 1998). Mesmo que não haja registro de consumo em escala industrial, a madeira é adequada para construção. A casca é adstringente, podendo ser utilizada no curtume (15-20% de tanino). Além disso, indústrias utilizam a tinta preta extraída da casca dessa espécie para o tingimento, conferindo a cor cinzenta ao algodão (Alberto et al., 2011).

3 CONCLUSÃO

O estudo da flora de Malpighiaceae para a Serra do Lenheiro foi realizado objetivando uma contribuição para o conhecimento da diversidade da família nesta Serra, assim como aumentar a visibilidade do local, incentivando estudos na área. O local não apresenta estrutura de apoio, sinalização ou segurança para os visitantes e pesquisadores, sendo assim alvo de preconceito por parte de estudantes que dão preferência a estudos na Serra de São José. Essas duas Serras possuem localização próximas e se situam na cidade sede da Universidade Federal de São João del-Rei. Essa situação foi experienciada durante os anos de coletas para este trabalho e de coletas para aumento do acervo do Herbário HUFSJ. O número de 23 espécies de Malpighiaceae encontrado nesse trabalho para a área de estudo é considerado alto em relação a outras serras próximas (1,3 Espécies/Km²), como a Serra de São José (0,88 Espécies/Km²) ou a Serra do Cipó (0,22 Espécies/Km²). Mostrando assim como a Serra do Lenheiro tem um potencial a ser explorado devido à grande diversidade de espécies. O gênero com maior número de espécies encontradas foi *Byrsonima*, com sete espécies, fato que nos chamou atenção para o estudo desse gênero. *Byrsonima* é um gênero que apresenta grandes dificuldades para seu estudo devido ao grande número de espécies descritas e de sinônimos, e a falta de trabalhos recentes.

Os domínios fitogeográficos presentes na Serra do Lenheiro: Cerrado e Floresta Atlântica são bem representativos em relação a diversidade de *Byrsonima* (49 e 27 espécies respectivamente), ficando atrás apenas do domínio Amazônico (51 espécies).

A escolha do estado do Espírito Santo e da Cadeia do Espinhaço para compor este trabalho foi devido a essas áreas serem de grande abrangência de *Byrsonima* para os biomas Floresta Atlântica e Cerrado, respectivamente.

O estado do Espírito Santo apresenta a maior diversidade de espécies de *Byrsonima* para o domínio da Floresta Atlântica e também um histórico de desmatamento e um grande número de espécies em extinção. O trabalho foi desenvolvido com exsicatas emprestadas pelos Herbários que concentram grande amostragem de coletas realizadas para o estado. Não foram realizados trabalhos de campo para essa área de estudo pelos autores.

O número de 17 espécies de *Byrsonima* encontradas para o estado do Espírito Santo foi menor do que o encontrado por trabalhos ou plataformas online, mas o número de oito

espécies excluídas é considerado significativo e pode justificar esse número mais baixo de espécies para a área. Para se chegar às espécies excluídas muito trabalho de revisão bibliográfica e utilização de tipos foram feitos e essa seção é importante para auxiliar na diferenciação clara de uma espécie próxima a outra ou a justificativa do porquê tal espécie foi considerada excluída para a área.

A Cadeia do Espinhaço é uma área de elevado grau de endemismo e de vegetação peculiar. O número de espécies é grande, assim como a alta concentração de espécies com distribuição restrita. Uma grande parcela de sua biodiversidade por isso encontra-se vulnerável e necessita de proteção. Estudos florísticos nessa área devem ser incentivados, assim como estudos filogenéticos e ecológicos capazes de estabelecer relações históricas entre espécies e definir fatores limitantes à manutenção de suas populações.

Para este trabalho, foram realizadas expedições de coleta de 20 dias, saindo da cidade de Ouro Branco (Minas Gerais), passando por várias cidades que compõem a Cadeia do Espinhaço, até o destino final da cidade de Morro do Chapéu (Bahia). Ainda durante essa viagem, foram visitados os herbários de Salvador (ALCB) e Feira de Santana (HUEFS).

Assim, este trabalho vem suprir a necessidade de uma melhor elucidação entre as espécies de *Byrsonima* em dois domínios fitogeográficos distintos, através de descrições de todas as espécies encontradas e chaves taxonômicas, assim como um levantamento florístico para Malpighiaceae para a Serra do Lenheiro, uma área de grande biodiversidade mas ainda com pouco reconhecimento.

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SEGUNDA PARTE

**ARTIGO 01: MALPIGHIACEAE FROM LENHEIRO MOUNTAIN RANGE, MINAS
GERAIS, BRAZIL**

**NORMAS DO PERIÓDICO RODRIGUÉSIA (VERSÃO ACEITA PARA
PUBLICAÇÃO)**

Malpighiaceae from Lenheiro Mountain Range, Minas Gerais, Brazil

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Abbreviated title: Lenheiro Mountain Range: Malpighiaceae

Abstract- Malpighiaceae from Lenheiro Mountain Range, Minas Gerais, Brazil

We present a taxonomic treatment for Malpighiaceae Juss. from the Lenheiro Mountain Range, São João del Rei, Minas Gerais, Brazil, where a total of 23 species and nine genera were recorded. Identification keys for all genera and species are presented, along with morphological descriptions, photo plates, and comments on distribution, ecology and taxonomy of the studied species.

Keywords

Cerrado, Malpighiales, Rocky Fields, Taxonomy

Resumo- Malpighiaceae na Serra do Lenheiro, Minas Gerais, Brasil

Apresentamos o tratamento taxonômico para Malpighiaceae na Serra do Lenheiro, São João del-Rei, Minas Gerais, Brasil, onde um total de 23 espécies e nove gêneros foram registrados. Chaves de identificação para os gêneros e espécies são apresentadas, além de descrições morfológicas, pranchas fotográficas e comentários sobre distribuição, ecologia e taxonomia das espécies estudadas.

Palavras-chave

Cerrado, Malpighiales, Campo rupestre, Taxonomia

Introduction

Malpighiaceae Juss. is one of the 36 families currently placed in Malpighiales (APG IV 2016). It comprises 77 genera and ca. 1300 species of trees, shrubs, subshrubs or lianas, distributed in the tropics worldwide, but predominantly in the Neotropics (Davis & Anderson 2010). The family is easily recognized by unicellular T-shaped hairs, calyx 8-10 glandular, and five clawed petals (Anderson 1979, 1981). In Brazil, Malpighiaceae is represented by 46 genera and ca. 588 species, occurring in all regions and phytogeographic domains of the country (Almeida *et al.* 2020a).

The state of Minas Gerais is the second most diverse in species of Malpighiaceae, comprising 205 species (Almeida *et al.* 2020a). The high diversity rates of plants in Minas Gerais is strictly associated to the variety of altitudes, soils and climates, in which rocky fields hold most of the biological diversity of this state (Giulietti 1987). The Lenheiro Mountain Range is located in southern Minas Gerais, being a relatively small mountain range but possessing great historical relevance, since it is crossed by the Brazilian Royal Road (Tavares 2011). Thus, this mountain range was visited several times in the past by famous naturalists who described new species from this region (Jussieu 1843). A complete floristic survey the Lenheiro Mountain Range has been recently presented by Costa (2019), evidencing the rich flora that this mountain range still holds.

With the aim to further expand the floristic knowledge of the Lenheiro Mountain Range, we present a taxonomic treatment for the Malpighiaceae, including a key for all species occurring in this region, morphological descriptions, specimens examined, photo plates, and comments on distribution, ecology and taxonomy of all species.

Material and Methods

Study area

The Lenheiro Mountain Range (Fig. 1) is a 1760 ha mountain range located northeastern of the urban center of the municipality of São João del-Rei, Minas Gerais state, Brazil (Ferreira 2015). The altitude in this region ranges from 900 to 1246 m, showing cambisols and oxisols, and a seasonal climate (Cwb) characterized by dry winters and moderately hot summers (Alvares et al. 2013; Ferreira 2015; Sá Júnior 2009). Additionally, physiognomies of two different phytogeographic domains are recorded in this mountain range, the Atlantic Forest and Cerrado. Most of this region is characterized by savannas associated with rocky fields vegetation over quartzite rocky outcrops, and seasonal forest patches, which might be related to the areas' great biodiversity (Vasconcelos 2011).

Taxonomy

The study was based on the analysis of collections from HUEFS, HUFSJ, NY, OUPR, RB, BHCB and SP (acronyms according to Thiers, continuously updated), complemented by specimens collected by us in the area between 2015 and 2018 and deposited at HUFSJ herbarium. Morphological terminology for vegetative characters followed Radford et al. (1974), and reproductive character followed Niedenzu (1928) and Anderson (1981). All photo plates were made using the Photoshop software (Adobe 2019), the map was elaborated using the ArcGIS 9.3 software (ESRI 2010), and shapefiles were obtained from IBGE (2015).

Results and Discussion

MALPIGHIACEAE Juss., Gen. Pl. 252. 1789.

Type: *Malpighia* L.

Trees, shrubs, subshrubs to lianas; unicellular hairs T-Y-V-shaped, rarely aciculate. *Stipules* epi- or interpetiolar, diminute or expanded. *Leaves* simple, opposite, rarely subopposite; leaf blade glandular, rarely eglandular, margins flat or revolute; petiole glandular, rarely eglandular. *Inflorescences* of first order of 1-3-flowered cincinni; second order inflorescences thyrsi, corymbs or umbels; third order inflorescences dichasia, thyrsi or panicles, axillary or terminal. *Flowers* zygomorphic, bisexual, heterocyclic, hypogynous. *Sepals* 5, glands 0-2 per sepal, anterior sepal usually eglandular. *Petals* 5, yellow or white to pink, free, clawed; posterior petal generally markedly different from lateral petals. *Stamens* 4-5-6-10, homo- or heteromorphic; anthers pubescent or glabrous. *Gynoecium* 2-3-carpellate, free or connate, 1-ovulate; ovule pendulous, anatropous; styles 1-3, free, rarely connate, apex acute, obtuse, capitate or truncate; stigma terminal or lateral. *Fruit* drupe, nut or schizocarp, the latter splitting into 3 mericarps, smooth, setose or winged.

A total of nine genera and 23 species were recorded at the Lenheiro Mountain Range.

Key for the genera of Malpighiaceae at the Lenheiro Mountain Range

1. Stipules expanded and connate into a cordiform structure; 5 fertile stamens, 5 staminodes.....**8. *Peixotoa***
1. Stipules absent or minute and free or connate into a bifid structure; 4 or 10 fertile stamens, 0 or 2 staminodes..... 2
2. Leaf blades acicular; style 1.....**3. *Camarea***
2. Leaf blades broad; styles 3..... 3

3. Apex of styles subulate, stigma minute; drupes.....**2. *Byrsonima***
3. Apex of styles obtuse, capitate to truncate, stigma well-developed; schizocarps..... 4
4. Mericarps with lateral wings more developed than the dorsal one..... 5
4. Mericarps with the dorsal wing more developed than the lateral ones..... 7
5. Bracteoles 1-glandular; lateral wings fused into an orbicular wing.....**6. *Mascagnia***
5. Bracteoles 0 or 2-glandular, never 1-glandular; 4 lateral wings X-shaped..... 6
6. Lianas; bracteoles eglandular.....**7. *Niedenzuella***
6. Shrubs; bracteoles 2-glandular.....**9. *Tetrapteryx***
7. Apex of style truncate, stigma lateral; dorsal wing abaxially thicker.....**5. *Heteropteryx***
7. Apex of styles capitate, stigma terminal; dorsal wing adaxially thicker..... 8
8. Petals glabrous, connectives glandular; mericarps without lateral
winglets.....**1. *Banisteriopsis***
8. Petals pubescent, connectives eglandular; mericarps with two lateral
winglets.....**4. *Diplopteryx***

1. *Banisteriopsis* C.B.Rob., N. Amer. Fl. 25(2): 131. 1910.

Shrubs, subshrub or lianas. Stipules interpetiolar, minute and free. *Leaves* opposite; leaf blades broad pilose to glabrous, glandular; petiole glandular. *Umbels* or thyrsi, arranged in dichasia or thyrsi, axillary to terminal. *Sepals* 2-glandular, except the anterior one. *Petals* yellow, pink or white, glabrous. *Stamens* 10, all fertile; connectives glandular, anthers pubescent to glabrous. *Ovary* sericeous, styles 3, apex capitate, stigma terminal well-

developed. *Schizocarps* splitting into 3 mericarps, winged, dorsal wing more developed than lateral ones, adaxially thicker.

Banisteriopsis comprises ca. 60 species distributed in several phytogeographic domains in the Neotropics (Gates 1982). In Brazil, 48 species are recorded, out of which 31 species occur in Minas Gerais state (Francener 2020a). Four species are recorded from the Lenheiro Mountain Range.

Key for the species of *Banisteriopsis* in the Lenheiro Mountain Range

1. Thyrsi; flowers yellow at anthesis.....**1.2 *Banisteriopsis gardneriana***
1. Umbels; flowers pink to white at anthesis..... 2
2. Posterior petal narrowly elliptic; styles arched.....**1.4 *Banisteriopsis muricata***
2. Posterior petal obovate to circular; styles erect..... 3
3. Primary and secondary veins abaxially impressed; petals pink to white at anthesis, becoming paler at post-anthesis, anthers pubescent.....**1.3 *Banisteriopsis malifolia***
3. Primary and secondary veins abaxially prominent; petals pink, not becoming pale at post-anthesis, anthers glabrous.....**1.1 *Banisteriopsis campestris***

1.1. *Banisteriopsis campestris* (A.Juss.) Little, Phytologia 6: 506. 1959. Figure 2A.

Subshrub to shrubs, 40–50 cm tall. *Leaf blades* 2.28–7.26 × 1.5–4.65 cm, narrowly-elliptic, elliptic to ovate to obovate, base rounded, margin plane, apex acuminate to mucronate, both sides densely tomentose, veins abaxially prominent, 1–2 pairs of glands near base; petiole 1.7–5.8 × 1.2–1.7 mm, densely sericeous, 0–1 pair of glands at apex. *Umbels*, 4-flowered,

axillary or terminal, solitary or arranged in dichasia; bracts ca. 1.9×1 mm, triangular; peduncle $1.67\text{--}26.2 \times 0.9\text{--}1.2$ mm, sericeous; bracteoles ca. 1.5×0.4 mm, lanceolate; pedicel $7.4\text{--}9 \times 0.8\text{--}0.9$ mm; sepals ca. 3.2×2.2 mm; sepal glands ca. 2.2×0.9 mm; petals pink, not becoming paler at post-anthesis; lateral petals blade ca. 7.2×8.2 mm, orbicular, claws ca. 5×0.2 mm, margin fimbriate; posterior petal blade $6.4\text{--}7.2 \times 6\text{--}6.3$ mm, obovate, glandular near the claw, claw $3.8\text{--}4.8 \times 0.9\text{--}1$ mm, margin fimbriate. *Stamens* heteromorphic; filaments $2.7\text{--}2.9 \times 0.4\text{--}0.6$ mm, glabrous; connectives $0.7\text{--}1.5 \times 0.3\text{--}1$ mm; anthers $1.1\text{--}1.4 \times 0.4\text{--}0.8$ mm, glabrous. *Ovary* pubescent; styles homomorphic, erects. *Mericarps* not seen, dorsal wings ca. $2.5 \times 1\text{--}1.5$ cm, sericeous (Carvalho 2010).

Specimens examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro: estrada que chega à torre, $21^{\circ}09'21''$ S, $44^{\circ}18'20''$ W, 957 m, 10.IV.2015, fl., *L.L. Alves 23* (HUFSJ); $21^{\circ}10'33''$ S, $44^{\circ}19'45''$ W, 1080 m, 09.VI.2017, bud., fl., *M.T.R. Costa 963* (HUFSJ); $21^{\circ}12'76''$ S, $44^{\circ}27'03''$ W, 976 m, 14.III.2017, bud., fl., *M.T.R. Costa 800* (HUFSJ); pico Nova a S. das Antenas, 10.I.2017, fl., *R.J.V. Alves 12555* (HUFSJ); águas férreas, $21^{\circ}13'08''$ S, $44^{\circ}28'44''$ W, 974 m, 21.02.2017, bud., fl., *M.T.R. Costa 737* (HUFSJ); trilha para o areal, parte central da serra, $21^{\circ}12'86''$, $44^{\circ}30'09''$ W, 1153 m, 12.XII.2017, bud., fl., *M.T.R. Costa 1294* (HUFSJ).

Banisteriopsis campestris is distributed across the Caatinga and Cerrado. In Brazil (Francener 2020a). This species is commonly found in campos rupestres throughout the entire Lenheiro Mountain Range.

1.2. *Banisteriopsis gardneriana* (A.Juss.) W.R.Anderson & B.Gates, Contr. Univ. Michigan Herb. 11: 54. 1975. Figure 2B-C.

Lianas. Leaf blades 9.97–12.24 × 5.4–8.11 cm, elliptic to ovate, base rounded, margin revolute, apex rounded to acuminate, adaxially glabrescent, abaxially tomentose, veins impressed, eglandular; petioles 1.42–12 × 2.5–2.8 mm, tomentose, 1-pair of glands at apex. *Thyrse*, several-flowered, axillar or terminal, solitary or arranged in thyrsi; bracts ca. 1.7 × 1 mm, triangular; peduncle ca. 3.5 × 1.2 mm, velutine; bracteoles ca. 1.4 × 0.5 mm, triangular; pedicels 5.3–10.08 × 0.7 mm; sepals 3–4.4 × 1.8–2.3 mm; sepal glands ca. 1.4 × 1 mm; petals yellow at anthesis; lateral petals blade 5.4–5.8 × 4.4–5 mm, orbicular, claws 1.7–2 × 0.4–0.5 mm, margin dentate; posterior petal blade ca. 3 × 0.4–0.9 mm, ovate, claw ca. 2.4 × 0.5 mm, margin fimbriate. *Stamens* heteromorphic; filaments ca. 2–3 mm long; connectives 0.5–2 × 0.2–1.6 mm; anthers ca. 1.1 × 0.6 mm, glabrous. *Ovary* sericeous, styles heteromorphic. *Mericarps* with dorsal wing ca. 2.5 × 1 cm, sericeous, nut ca. 3.6 × 3.3 mm.

Specimens examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, IX.1897, fl., *F.P. Magalhães-Gomes s.n.* (OUPR 18580); saindo da estrada que segue para o povoado de Cunha, 21°07'21" S, 44°18'07" W, 985 m, 21.IX.2016, fl., bud., *L.L. Alves 155* (HUFSJ).

Additional specimen examined: BRAZIL. Minas Gerais. Tiradentes: Serra de São José, trilha do mangue, águas santas, 21°06'01,2" S, 44°52'04,7" W, 1085 m, 28.VIII.2010, bud., fl., *M. Sobral 13310* (HUFSJ).

Banisteriopsis gardneriana is widely distributed across the Cerrado and Caatinga domain in Brazil (Francener 2020a). At the Lenheiro Mountain Range, this species is found in campos rupestres, but not very often.

There are few fruiting collections of this species, possibly because this species might produce few fruits, or they are early dispersed (Gates 1982). Despite that, there are two fruiting collections at the Lenheiro Mountain Range one of them, and one of than, is more than 100

years old. *Banisteriopsis gardneriana* is only this genus with petals yellow and has not inflorescence in umbels at Lenheiro Mountain Range at the moment.

1.3. *Banisteriopsis malifolia* (Nees & Mart.) B.Gates, Fl. Neotrop. Monogr. 30: 76. 1982.

Figure 2D

Subshrubs or shrubs, 0.4–1.5 m tall. *Leaf blades* 3.3–7.86 × 2.15–5.86 cm, elliptic to ovate, base cordate to rounded, apex acuminate, margins flat, abaxial side densely sericeous, adaxial side glabrescent, veins impressed, 1 pair of glands on the abaxial side, along the midvein near the first pair of secondary veins; petioles ca. 1.4 × 1.4 mm, densely velutine, eglandular. *Umbels*, 4-flowered, axillary or terminal, solitary or arranged in dichasia; bract ca. 3.3 × 2.2 mm, triangular; peduncle inconspicuous; bracteoles not seen, 1.8–2.8 mm, lanceolate to broadly oblong (Gates 1982); pedicels 7–11.2 × 1.3–1.5 mm; sepals ca. 5.5 × 3.3 mm; sepal glands ca. 3 × 1.3 mm; petals pink becoming paler at post-anthesis; lateral petals blade ca. 10 × 9.7 mm, orbicular, claw ca. 2.4 × 0.9 mm, margins dentate; posterior petal blade ca. 8.3 × 7.7 mm, circular, claw ca. 4.5 × 0.9 mm, orbicular, margin dentate. *Stamens* heteromorphic; filaments ca. 2.8 × 0.5 mm, glabrous; anthers ca. 1.5 × 0.9 mm, slightly pubescent; connective glandular, the opposite sepals ca. 1.2 × 1 mm, the opposite petals ca. 0.9 × 0.9 mm, ca. 0.3 mm longer than the anther sacs, apex rounded. *Styles* homomorphic, erects. *Mericarps*, dorsal wings ca. 2.08 × 1.1 cm, sericeous, carpophore ca. 1.5 × 0.7 mm, nut ca. 5 × 4.1 mm.

Specimen examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, 21°12'76" S, 44°27'03" W, 976 m, 10.IV.2017, bot., *M.T.R. Costa* 827 (HUFSJ).

Additional specimens examined: BRAZIL. Minas Gerais. São João del-Rei: distrito do Rio das Mortes, loteamento Pinheiros, 21°11'56" S, 44°20'25" W, 940 m, 06.V.2017, fl., fr., *L.L. Alves* 150 (HUFSJ).

Banisteriopsis malifolia is widely distributed across the Amazon, Caatinga, Cerrado, Atlantic Forest domain in Brazil (Francener 2020a). At the Lenheiro Mountain Range, this species is found in campos rupestres.

Hairs in *Banisteriopsis malifolia* are usually irritating in contact to skin.

1.4. *Banisteriopsis muricata* (Cav.) Cuatrec., *Webbia* 13(2): 503–504. 1958. Figure 2E-F.

Shrubs or lianas, ca. 0.5 m tall. *Leaf blades* 3.1–12.6 × 3–8 cm, orbicular to ovate, base cordate to attenuate, margins flat, apex acute to acuminate to cuspidate, abaxial side densely tomentose or sericeous, adaxial side slightly sericeous, glabrescent, veins impressed, eglandular or with 1 pair of glands along the secondary veins; petioles 14–15 × 1.2–2.2 mm, tomentose, eglandular or with 1 pair of glands. *Umbels*, 4-flowered, axillary or terminal, solitary or arranged in dichasia; bracts ca. 1.5 × 1.2 mm, triangular; peduncles 4.7–6.4 × 0.6–0.7 mm, densely tomentose; bracteoles ca. 1.1 × 0.8 mm, triangular; pedicels 7–8.4 × 0.8–1 mm; sepals ca. 3.4 × 2 mm, eglandular; petals pink to white, lateral petals blade ca. 4 × 3.8 mm, orbicular to broadly elliptic, claws ca. 2.3 × 0.6 mm, margins dentate; posterior petal blade 6.6 × 3.3 mm, narrowly elliptic, claw ca. 2.8 × 1.4 mm, base broad, margins dentate. *Stamens* heteromorphic; filaments ca. 2.1 × 0.3 mm, glabrous; anthers ca. 1 × 0.7 mm, glabrous; connectives of the stamens opposite to the antero-lateral sepals glandular, ca. 0.7 × 0.4 mm, connectives of the stamens opposite the lateral sepals densely glandular, broad, ca. 1.8 × 1.2 mm, ca. 1.4 mm longer than the anther sacs, apex rounded. *Styles* heteromorphic, 2 arched, 1 straight, glabrous. *Mericarps*, dorsal wings ca. 3 × 1.3 cm, sericeous, carpophore ca. 2.2 × 0.4 mm, nut ca. 6.4 × 5 mm.

Specimen examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, 21°10'33" S, 44°19'45" W, 971 m, 9.VI.2017, fr., *M.T.R. Costa 971* (HUFJSJ).

Additional specimen examined: BRAZIL. Minas Gerais. São João del-Rei: rua Otávio Angelo Calsavara, bairro Colônia, 21°45'55" S, 44°14'19" W, 13.II.2011, fl., *M. Sobral 13757* (HUFSJ).

Banisteriopsis muricata is widely distributed across the Amazon, Caatinga, Cerrado, Atlantic Forest in Brasil (Francener 2020a). At the Lenheiro Mountain Range, this species is found in vegetation over campos rupestres.

2. *Byrsonima* Rich. ex Kunth, Nov. Gen. Sp. (quarto ed.) 5: 147. 1821[1822].

Trees, shrubs or subshrubs, branches aerial or underground. *Stipules* epipetiolear, connate, minute. *Leaves* opposite; petioles eglandular; blades broad glabrous or pilose, eglandular. *Thyrse* sessile or pedunculate, cincinni 1-2-flowered. *Sepals* all 2-glandular. *Petals* yellow to orange or red or pink or white, glabrous. *Stamens* 10, all fertile, free or connate at base; connectives glandular, anthers sericeous to glabrous. *Ovary* glabrous or sericeous, styles 3, glabrous, apex acute, stigma terminal. *Drupe*s, exocarp fleshy, green when immature, yellow to red when mature.

Byrsonima comprises ca. 150 species distributed in several phytogeographic domains in the Neotropics (Niedenzu 1928). In Brazil, 99 species are recorded, out of which 40 occur in the state of Minas Gerais (Francener 2020b). Seven species are recorded for the Lenheiro Mountain Range.

Key to the species of *Byrsonima* at the Lenheiro Mountain Range

1. Flowers yellow, becoming orange or red after anthesis..... 2
- 1'. Flowers pink to white, becoming paler after anthesis or posterior petal yellow to red and laterals petals pink to white..... 5

2. Stamens free at base; ovary glabrous..... 3
- 2'. Stamens connate at base; ovary sericeous-tomentose.....**2.3. *Byrsonima pachyphylla***
3. Leaf blade both glabrous to slightly sericeous mostly along the midrib; petiole ca. 3 mm.....**2.2. *Byrsonima intermedia***
- 3'. Leaf blade both tomentose; petiole sessile..... 4
4. Inflorescence axis ca. 30 cm long; indumentum predominantly white.....**2.7. *Byrsonima verbascifolia***
- 4'. Inflorescence axis ca. 9 cm long; indumentum predominantly ferruginous.....**2.4. *Byrsonima stannardii***
5. All the petals pink to white becoming paler after anthesis; leaf blade sericeous to glabrate to glabrous..... 6
- 5'. Posterior petal yellow to red and laterals petals pink to white; leaf blade abaxially tomentose..... **2.6. *Byrsonima variabilis***
6. Leaf blade sericeous to glabrate, obovate to oblong; veins green.....**2.5. *Byrsonima vacciniifolia***
- 6'. Leaf blade glabrous, circular to ovoid; veins pink.....**2.1. *Byrsonima coccolobifolia***

2.1. *Byrsonima coccolobifolia* Kunth, Nov. Gen. Sp. (quarto ed.) 5: 148. 1821[1822]. Figure 2G.

Trees or shrubs, 1.6–2.5 m tall, branches aerial. *Stipules* ca. 2.2 × 1.5 mm, triangular. *Leaf blades* 6–12 × 4.6–6.9 cm, ovate to circular, base rounded to attenuate, margins flat, apex rounded, glabrous on both sides, primary and secondary veins pink; petiole inconspicuous.

Thyrsi sessile, ca. 30-flowered, main axis 6.8–13.6 cm; bract ca. 2.6×1 mm, lanceolate, abaxial side slightly tomentose, adaxial side glabrous; bracteoles ca. 1.5×0.5 mm, lanceolate; pedicels $1\text{--}8.7 \times 0.6\text{--}0.8$ mm, densely tomentose. *Sepals* ca. 3.2×2 mm, abaxial side glabrescent, adaxial side densely sericeous, revolute at anthesis, ovate; glands ca. 2×0.8 mm, white to pink; petals white to pink becoming paler after anthesis; lateral petals blade ca. 4.5×4 mm, claw ca. 2.7×0.5 mm, margins entire; posterior petal blade ca. 2.5×4.6 mm, claw ca. 4.3×0.6 mm, margins entire. *Stamens* free, homomorphic; filaments ca. 2.6×0.7 mm, densely sericeous at base; anthers ca. 2.4×1 mm, sericeous; connectives ca. 1.8×0.8 mm, not surpassing the anther sacs. *Ovary* glabrescent; styles ca. 4.8×0.3 mm. *Drupes* not seen, 7–8 mm diam., ovoid to globose (Anderson 1981).

Specimen examined: BRAZIL. Minas Gerais, São João del-Rei: Serra do Lenheiro, 21°13'19" S, 44°27'59" W, 989 m, 14.IV.2017, bud., *M.T.R. Costa 801* (HUFSJ).

Additional specimen examined: BRAZIL. Minas Gerais, São João del-Rei: loteamento Pinheiros, distrito do Rio das Mortes, 21°19'89" S, 44°34'42" W, 26.XI.2017, bud., fl., *L.L. Alves 227* (HUFSJ).

Byrsonima coccolobifolia is widely distributed across the Amazon, Cerrado and Atlantic Forest domain in Brazil (Francener 2020b). At the Lenheiro Mountain Range, this species is found in campos rupestres.

2.2. *Byrsonima intermedia* A.Juss., Fl. Bras. Merid. (quarto ed.) 3(22): 82. 1832[1833].

Figure 2H.

Shrub, 0.4–1.1 m tall, trunks and branches aerial. *Stipules* $2.5\text{--}3 \times 0.8\text{--}1.4$ mm, lanceolate. Leaves opposite, leaf blades $3.68\text{--}11.74 \times 1.54\text{--}4.4$ cm, elliptic to ovate, apex acute to

acuminate to rounded, margin slightly revolute, base attenuate, both the sides glabrous to slightly sericeous mostly along the midrib; petiole 2.8–3.1 × 1.7–2 mm, expanded at base, sericeous. *Thyrsi*, ca. 20-flowered, main axis ca. 6.15 cm long; bract ca. 1.7 × 0.4 mm, lanceolate, adaxially glabrous, abaxially tomentose; peduncle absent; bracteoles ca. 1.4 × 0.6 mm, triangular; pedicel ca. 5.1 × 1 mm, densely tomentose; sepals ca. 2.6 × 1.6 mm, ovate, both sides tomentose; glands ca. 2 × 0.9 mm, green to yellow; petals yellow becoming orange or red after anthesis, lateral petals blade ca. 4 × 3.8 mm, claw ca. 2.3 × 0.3 mm, margin crenate; posterior petal blade ca. 2.3 × 3.7 mm, claw ca. 2.6 × 0.8 mm, margin erose. *Stamens* free, homomorphic; anthers ca. 2.5 × 0.8 mm, sericeous; connectives ca. 1.7 × 0.4 mm, equaling pollen sacs; filaments ca. 2.1 × 0.4 mm, sericeous. *Ovary* glabrous; style ca. 3 × 0.3 mm. *Drupes not seen*, ca. 5 mm diam, globose (Mamede 1987).

Specimens examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, estrada que chega à torre, 21°09'32" S, 44°17'22" W, 994 m, 27.III.2015, bud., fl., *L.L. Alves 15* (HUFSJ); 21°14'20" S, 44°29'30" W, 1131 m, 9.V.2015, fl., *M.T.R. Costa 357* (HUFSJ); 21°14'42" S, 44°29'43" W, 1089 m, 10.XII.2017, bud., *M.T.R. Costa 1276* (HUFSJ); acesso pela estrada para Cunha, 21°07'11" S, 44°17'23" W, 1046 m, 26.IV.2018, fl. *M.T.R. Costa 1463* (HUFSJ).

Byrsonima intermedia is distributed across the Amazon, Cerrado, Atlantic Forest and Pantanal domain in Brazil (Francener 2020b). At the Lenheiro Mountain Range, this species is found in campos rupestres. Even though the leaves of *B. intermedia* usually glabrous on both sides, we recorded a few specimens covered by a sericeous indumentum, becoming glabrescent age.

2.3. *Byrsonima pachyphylla* A.Juss., Fl. Bras. Merid. (quarto ed.) 3(22): 77. 1832 [1833].

Figure 2I.

Trees, 3–5 m tall, branches aerial, erect or tortuous. *Stipules* ca. 5.5 × 4 mm, wide-triangular. *Leaves*, leaf blades 15–19 × 8–10.5 cm, coriaceous, lanceolate to elliptic, apex acuminate, margin slightly revolute, base cuneate, adaxially glabrous to sericeous-tomentose at midrib, abaxially tomentose; petioles sessile to up to 4–10 mm long, velutine. *Thyrsi* of 1–2 flowered cincinni, 6–36 cincinni distributed in the median and distal portion of the rachis, rachis 5.5–16.5 cm long; bracts and bracteoles deciduous to persistent in fruiting; bracts ca. 7 × 2 mm, triangular, adaxially glabrous, abaxially sericeous-velutine; peduncle sessile; bracteoles ca. 3 × 1.5 mm, triangular; pedicels ca. 8 mm long, tomentose; sepals ca. 5.5 × 3 mm, ovate, revolute in anthesis, adaxially glabrous, abaxially sericeous to sericeous-tomentose; glands ca. 2.5 × 1 mm, yellow; petals yellow becoming orange or red after anthesis, lateral petals blade ca. 7.5 × 9 mm, margin slightly erose, claws ca. 5.5 × 0.5 mm; posterior petal blade ca. 5.5 × 6.5 mm, margin erose, claw ca. 4.5 × 1 mm. *Stamens* connate at base; filaments ca. 3 × 1 mm, pilose at base; connectives ca. 2 × 1 mm, exceeding or not the locules up to 0.2 mm long, apex acute; anthers ca. 2.5 × 0.8 mm, sericeous to glabrous. *Ovary* sericeous-tomentose; *styles* ca. 4.5 × 0.2 mm. *Drupes* not seen, 5–7 mm diam., ovoid, glabrescent, calyx persistent (Francener 2016).

Specimen examined: BRAZIL. Minas Gerais. São João del Rei: Serra do Lenheiro, 1300 m, 25.IV.1957, fl., *E. Pereira 3141* (RB, SP).

Byrsonima pachyphylla is distributed across the Amazon and Cerrado domain in Brazil (Francener 2020b). At the Lenheiro Mountain Range, this species is found in campos rupestres.

2.4. *Byrsonima stannardii* W.R.Anderson, Kew Bull. 47(4): 725–727, f. 1. 1992. Figure 3A-C.

Subshrubs to shrubs, 0.4–1.5 m tall, branches and trunks aerals. *Stipules* ca. 5.5 × 2.4 mm, triangular. Leaf blades 5.5–11.63 × 2.48–6 cm, elliptic to obovate, apex rounded to retuse, margin flat, base attenuate to oblique, both sides tomentose, ferruginous; petiole sessile. *Thyrse*, ca. 30-flowered, main axis ca. 9 cm,; bract ca. 4.4 × 0.7 mm, lanceolate, adaxially glabrescent, abaxially tomentose; peduncle absent; bracteole ca. 2.8 × 0.6 mm, lanceolate; pedicel ca. 11.5 × 1 mm, tomentose; sepals ca. 3.4 × 2.2 mm, adaxially glabrous, abaxially tomentose, apex revolute in anthesis, ovate; glands ca. 2.4 × 1 mm, green to yellow to orange; petals yellow becoming orange or red after anthesis, lateral petals blade ca. 4.4 × 6.2 mm, claw ca. 2.8 × 0.4 mm, margin crenate; posterior petal blade ca. 3.2 × 2.8 mm, claw ca. 2.8 × 0.4 mm, margin erose. *Stamens* free at base, homomorphic; anthers ca. 2.4 × 0.8 mm, glabrous to sericeous; connectives ca. 1.9 × 0.4 mm, longer than pollen sacs in ca. 0.1 mm, apex acute; filaments ca. 2.0 × 0.6 mm, sericeous at base. *Ovary* glabrous; styles 4.2 × 0.3 mm. *Drupe*s ca. 7.4 mm diam., globose, glabrous.

Specimens examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, estrada para o Cunha, próximo a Escola de Montanhismo do Exército, 21°08'32" S, 44°18'01" W, 1122 m, 16.X.2018, bud., fl., *L.L. Alves* 242 (HUFJSJ); trilha alternativa de acesso às torres de transmissão, 21°15'73" S, 44°30'02" W, 1080 m, 6.IV.2017, bud, fl., *M.T.R. Costa* 833 (HUFJSJ); estrada para Trindade, 21°08'26" S, 44°17'36" W, 25.XII.2012, fl., fr., *M. Sobral* 15285 (HUFJSJ).

Byrsonima stannardii is distributed across the Cerrado domain in Minas Gerais and Bahia states in Brazil (Francener 2020b). The species is not frequent at the Lenheiro Mountain Range, being found in campos rupestres.

2.5. *Byrsonima vacciniifolia* A.Juss., Fl. Bras. Merid. (quarto ed.) 1(3): 84. 1825. Figure 3D-F.

Subshrubs, shrubs, 0.6–2 m tall; branches aerial; stipules triangular. *Leaf blades* ca. 4 × 1.2 cm, obovate to oblong, apex emarginate to rounded, margin flat, base attenuate, both sides sericeous to glabrescent, white; petiole ca. 0.3 mm, sericeous to glabrous. *Thyrse*, ca. 15-flowered, main axis ca. 2.2 cm long; bract ca. 2 × 1 mm, lanceolate, adaxially glabrous, abaxially sericeous; peduncle absent; bracteole ca. 1.2 × 0.9 mm, lanceolate; pedicel ca. 0.8 mm, sericeous; glands ca. 1.5 × 0.8 mm, white to pink; petals white becoming paler after anthesis; lateral petals blade ca. 5 × 5.2 mm, claw pink, ca. 3.6 × 0.8 mm; posterior petal blade ca. 3.4 × 4 mm, claw pink, ca. 3.6 × 1.6 mm. *Stamens* free, homomorphic; anthers ca. 1.8 × 0.9 mm, slightly pubescent; connectives ca. 2 × 0.5 mm, the one opposite the posterior petal equaling the pollen sacs, the remaining ones ca. 0.9 mm longer; filaments ca. 2.6 × 0.4 mm, sericeous at base. *Ovary* glabrous; styles ca. 3.5 mm long. *Drupes* ca. 5.5 mm diam., globose, glabrous.

Specimen examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, 22.VII.1881, fl., A.F.M. Glaziou 12480 (NY).

Byrsonima vacciniifolia is distributed across the Cerrado and Caatinga domain in Brazil (Francener 2020b). At the Lenheiro Mountain Range, this species is not found in expeditions and has few collection records for Minas Gerais state.

The only specimen of *Byrsonima vacciniifolia* from the study site was collected by the French botanist Auguste Glaziou more than 100 years ago. The only specimen of *B. vacciniifolia* from the study site was collected by the French botanist Auguste Glaziou more than 100 years ago.

2.6. *Byrsonima variabilis* A.Juss., Fl. Bras. Merid. (quarto ed.) 3(22): 78. 1832[1833]. Figure 3G-H.

Shrubs, 0.8–1.8 m tall, branches aerial; stipules ca. 3.8×2.6 mm, triangular. *Leaf blades* $3.1\text{--}11.1 \times 1.33\text{--}5.48$ cm, elliptic to obovate to obtuse, apex rounded to mucronulate to apiculate, margin flat, base rounded to oblique, adaxially glabrescent, abaxially tomentose, ferruginous; petiole ca. 4×2.3 mm, tomentose. *Thyrsi*, ca. 30-flowered, main axis 4.14–9.3 cm; bract ca. 9×1.2 mm, lanceolate, adaxially glabrescent, abaxially tomentose; peduncle absent; bracteole ca. 5.5×1 mm, lanceolate; pedicel ca. 7.4×1 mm, tomentose; sepals ca. 4.5×2.6 mm, adaxially glabrous, abaxially tomentose, apex revolute, ovate; glands ca. 3×1.3 mm, white to pink; lateral petals white to pink becoming paler after anthesis, blade ca. 5.6×7.3 mm, claw ca. 3.7×0.5 mm, margins erose; posterior petal yellow becoming orange to red after anthesis, blade ca. 3.5×3.7 mm, claw ca. 3.8×1.2 mm, margins erose. *Stamens* free, homomorphic; filaments ca. 3.3×0.7 mm, barbate at base; anthers ca. 2.8×0.8 mm, glabrous; connectives ca. 2.4×0.6 mm, not surpassing the anther sacs or barely surpassing the anther sacs ca. 0.01 mm, apex rounded. *Ovary* glabrous; styles ca. 5×0.3 mm. *Drupes* not seen.

Specimens examined: BRAZIL. Minas Gerais, São João del-Rei: Serra do Lenheiro, subida pelo Lenheiros, próximo à queda d'água, 21°08'21" S, 44°17'11" W, 1012 m, 16.X.2018, bud., fl., *L.L. Alves* 237 (HUFSJ); 21°13'81" S, 44°29'12" W, 1051 m, 28.X.2016, fl., *M.T.R. Costa* 643(HUFSJ), 21°08'24" S, 44°17'19" W, 1028 m, 16.IX.2013, bud., fl., *A. Francener* 1392 (HUFSJ, SP); porção da serra atrás da base do Exército, 21°15'25" S, 44°30'55" W, 1128 m, 11.VIII.2017, bud., fl., *M.T.R. Costa* 1107 (HUFSJ); 21°14'55" S, 44°30'20" W, 1196 m, 5.VIII.2017, bud., fl., *M.T.R. Costa* 1058 (HUFSJ), 21°07'52" S, 44°18'04" W, 1161 m, 8.I.2017, fl., *M.T.R. Costa* 681 (HUFSJ).

Byrsonima variabilis is distributed across the Cerrado and Atlantic Forest domain in Brazil (Francener 2020b). At the Lenheiro Mountain Range, this species is found in campos rupestres.

2.7. *Byrsonima verbascifolia* (L.) DC., Prodr. 1: 579. 1824. Figures 3I, 4A.

Shrubs 0.2-1.8 m tall, branches aerial. *Stipules* ca. 9×5 mm, triangular. *Leaf blades* 2.9–15.3 \times 2–10.8 cm, elliptic to ovate to obovate, base attenuate to rounded, margins flat, apex rounded to truncate to acute, both sides densely tomentose, white; petiole sessile. *Thyrse* sessile, ca. 38-flowered, main axis 13.2–33.3 cm; bract ca. 6.5×2.8 mm, triangular to lanceolate, abaxial side densely tomentose, adaxial side glabrous; peduncle sessile; bracteole ca. 3.8×1.5 mm, triangular to lanceolate; pedicel ca. 11.3×1.1 mm, densely tomentose; sepals ca. 5×2.6 mm, abaxial side densely tomentose, adaxial side glabrous, revolute at anthesis; glands ca. 2.3×1 mm, green to yellow to red; petals yellow becoming orange to red after anthesis, lateral petals blade ca. 5.3×7 mm, claw ca. 4.6×0.5 mm, margins erose; posterior petal blade ca. 4.4×4.3 mm, claw ca. 4.1×0.8 mm, margins erose. *Stamens* free, homomorphic; filaments ca. 4.1×0.4 mm, sericeous at base; anthers ca. 2.9×1.2 mm, sparsely sericeous; connectives ca. 2.3×0.5 mm, not surpassing the anther sacs to barely surpassing the anther sacs ca. 0.01 mm, apex rounded. *Ovary* glabrous, styles ca. 4.8×0.3 mm. *Drupes* 5.5–11 diam., globose, glabrous to sparsely sericeous.

Specimens examined: BRAZIL. Minas Gerais, São João del-Rei: Serra do Lenheiro, subida pelo Lenheiros, próximo à queda d'água, 21°08'25" S, 44°17'11" W, 1012 m, 16.X.2018, bud., fl., *L.L. Alves* 236 (HUFSJ); 21°13'19" S, 44°27'59" W, 989 m, 14.IV.2017, fr., *M.T.R. Costa* 802 (HUFSJ), estrada para Trindade, bairro Tejuco, 21°14'10" S, 44°28'67" W, 992 m, 26.IV.2017, fr., *M.T.R. Costa* 903 (HUFSJ), subida pela parte de trás da igreja São José,

21°07'39" S, 44°17'21" W, 1020 m, bud., fl., fr., 16.X.2015, *L.L. Alves 43* (HUFSJ), 21°14'07" S, 44°29'28" W, 1085 m, 13.III.2015, bud., fl., *M.T.R. Costa 397* (HUFSJ); trilha lateralmente à esquerda da principal que leva a torre, 21°09'29" S, 44°18'05" W, 1056 m, 22.V.2015, bud., fl., *L.L. Alves 36* (HUFSJ), 21°14'55" S, 44°30'20" W, 1196 m, 5.VIII.2017, bud., fl., *M.T.R. Costa 1060* (HUFSJ); 21°09'21" S, 44°18'20" W, 957 m, 10.IV.2015, fl., *L.L. Alves 21* (HUFSJ); 15.IX.1897, bud., fl., *F.M. Magalhães-Gomes s.n.* (OUPR 18581); 1300m, 25.IV.1957, bud., fl., *E. Pereira 3141* (RB).

Byrsonima verbascifolia is widely distributed across the Amazon, Caatinga, Cerrado and Atlantic Forest domain in Brazil (Francener 2020b). At the Lenheiro Mountain Range, this species is found in campos rupestres. *Byrsonima subterranea* has recently been placed as a synonym for *B. verbascifolia* in Flora of Brazil studies (Francener 2020b).

3. *Camarea* A.St.-Hil., Bull. Sci. Soc. Philom. Paris 1823: 133. 1823.

Subshrubs, underground stem a xylopodium. *Stipules* absent. *Leaves* opposite or subopposite; blades acicular glabrous or pilose, glandular; petioles when present eglandular. *Thyrse* or umbels, inflorescences at the basal nodes bearing cleistogamous flowers, the ones in the apical nodes bearing chasmogamous flowers, cincinni 1-flowered. *Flowers* dimorphic, the cleistogamous diminute, sepals eglandular, lacking petals, stamen 1, filaments absent or nearly so, ovary 2-carpellate, styles and stigmas absent; the chasmogamous perfect. *Sepals* 5, the lateral 2-glandular. *Petals* yellow, glabrous. *Stamens* 4, basally connate, staminodes 2, connectives inconspicuous, eglandular, not surpassing the anther sacs, anthers glabrous. *Ovary* 3-carpellate, style 1, stigma terminal, capitate. *Mericarps* with dorsal wing developed or not, nut smooth or setose or crested; areole ventral, small, concave.

Camarea being represented by eight species, of which five are recorded for Minas Gerais (Sebastiani 2020) and two at the Lenheiro Mountain Range.

Key for the species of *Camarea* at the Lenheiro Mountain Range

1. Leaves sessile, blades elliptic to lanceolate, with acicular hairs, margins flat; ovary sericeous; mericarps setose.....**3.1 *Camarea affinis***

1. Leaves petiolar, blades acicular to linear-lanceolate, slightly sericeous, margins strongly revolute; ovary glabrous; mericarps winged.....**3.2 *Camarea ericoides***

3.1. *Camarea affinis* A.St.-Hil., Hist. Pl. Remarq. Brasil, 157. 1825. Figure 4B-C

Subshrubs 20-40 cm tall. *Leaf blades* 1.6–15.8 × 1.6–5.5 mm, elliptic to lanceolate, base cordate, margins flat, ciliate with acicular hairs, apex acute to acuminate, adaxial side with acicular hairs, abaxial side with acicular hairs along the primary vein, 2-glandular near the margins; petiole absent. *Thyrsi* solitary or arranged in umbels; peduncle 3.7-6.1 mm long, sparsely sericeous; main axis 2.3-6.8 cm long; bracts ca. 3.4 × 0.8 mm, margins ciliate with acicular hairs, abaxial side with acicular hairs; bracteoles 0.8–1.5 × ca. 0.4 mm, lanceolate; pedicels 3.2-4.8 mm long, glabrous. *Sepals* ca. 2.6 × 1.8–3.4 mm, ovate to broadly ovate, adaxial side glabrous, abaxial side sericeous; glands 1.5–2 × 0.7–0.8 mm, cream colored, elliptic to ovate; lateral petals blade ca. 6.2 × 4.8 mm, margins erose, claw ca. 2.4 × 0.5 mm; posterior petal blade ca. 3.7 × 4.7 mm, margins erose, claw ca. 4.7 × 1 mm. *Stamens* heteromorphic; filaments ca. 1.8 × 0.4 mm, glabrous; anthers ca. 0.6 × 0.6–0.7 mm, glabrous; connectives ca. 0.4 × 0.2 mm. *Ovary* sericeous, style ca. 3.3 × 0.3 mm, glabrous. *Mericarps* setose, developing from cleistogamous flowers, nut glabrous, setae pilose at apex; fruits from

chasmogamous flowers not seen; the mericarps lacking a dorsal wing and possess setose and glabrous nuts, with the setae pilose only at apex (Mamede 1990)

Specimens examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, 21°12'76" S, 44°27'03" W, 976 m, 14.IX.2017, fl., *M.T.R. Costa 799* (HUFSJ); acesso pelo Senhor dos Montes, 21°12'41" S, 44°28'00" W, 967 m, 25.I.2018, bud., fl., *M.T.R. Costa 1331* (HUFSJ); subida para a torre pelo Tijuco, 21°09'32" S, 44°17'22" W, 994m, 27.III.2015, fl., *L.L. Alves 14* (HUFSJ); subida pelo Barro Preto, 21°81'98" S, 44°17'12" W, 1043m, 06.III.2015, bud., fl., fr., *S.N. Carvalho 3* (HUFSJ); 3.I.2006, bot., fl., *A. Rapini 1280* (HUEFS).

Camarea affinis is distributed across the Cerrado domain in Brazil (Sebastiani 2020). At the Lenheiro Mountain Range, this species is found in campos rupestres.

3.2. *Camarea ericoides* A.St.-Hil., Bull. Sci. Soc. Philom. Paris, 1823: 133. Figure 4D.

Subshrubs ca. 15 cm tall, xylopodium present or not. *Leaf blades* 1.4–9.4 × 0.8–5.3 mm, acicular to linear-lanceolate, base obtuse, margins strongly revolute, glabrous, apex acute, adaxial side sparsely sericeous, glabrescent, abaxial side sericeous, 2-glandular near the base and margins; petiole 0.3–0.6 mm long. *Thyrsi* solitary; peduncle 1.6–2.4 × 0.3–0.5 mm; main axis ca. 3.5 cm long; bracts ca. 3.1 × 0.4 mm, adaxial side glabrous, abaxial side sericeous; bracteoles ca. 0.9 × 0.4 mm, elliptic; pedicels, 2.5–3.7 mm × 0.4–0.5 mm; sepals ca. 2.2 × 2 mm, ovate, apex rounded, both sides glabrous; glands ca. 1.4 × 1 mm, orbicular to obovate. *Stamens* heteromorphic; filaments ca. 3 × 0.5 mm, glabrous; anthers 0.6 × 0.6 mm, glabrous; connectives ca. 0.3 × 0.2 mm. *Ovary* glabrous; style ca. 3.5 × 0.3 mm, glabrous. Cleistogamous flowers not seen, produced at the apex of very reduced branches. They lack

sepal glands and petals, present a sole stamen and a 2-carpellate ovary. On the other side, the mericarps present a developed dorsal wing, and a glabrous and setose nut (Mamede 1990).

Specimen examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, acesso pela trilha em frente a base do exército, 21°13'15" S, 44°30'12" W, 1162 m, 28.II.2017, bot., fl., *M.T.R. Costa 1231* (HUFSJ).

Camarea ericoides is distributed across the Cerrado domain in Brazil (Sebastiani 2020). At the Lenheiro Mountain Range, this species is found in campos rupestres.

4. *Diplopterys* A.Juss., Icon. Sel. Pl. 3: 20, pl. 33. 1837.

Lianas. *Stipules* interpetiolar, minute, free. *Leaves* opposite; petioles eglandular; blades broad glabrous, eglandular. *Umbels* 4-10-flowered, solitary or arranged in thyrsi. *Sepals* all 2-glandular. *Petals* yellow, abaxial side pubescent. *Stamens* 10, fertile; connectives not surpassing the anther sacs; anthers glabrous. *Ovary* 3-carpellate; styles 3, capitate, stigmas terminal well developed. *Mericarps* with developed dorsal wing, adaxially thickened, nuts crested with two lateral winglets, calyx persistent.

A total of 20 species are recorded from Brazil, where six species are known to occur in Minas Gerais (Almeida 2020b), where a sole species occurs at the Lenheiro Mountain Range.

4.1. *Diplopterys pubipetala* (A.Juss.) W.R.Anderson & C.C.Davis, Harvard Pap. Bot. 11(1): 13. 2006. Figure 4E-F.

Lianas, branches glabrescent. *Stipules* ca. 0.3 × 0.2 mm, sparsely sericeous on both sides, apex acute. *Leaf blades* ca. 5.5 × 3.7 mm, elliptic to ovate, base rounded to attenuate, margins flat, apex cuspidate to caudate, adaxial side glabrescent, abaxial side glabrous and several

minute glands impressed; petioles ca. 6.6×1.1 mm, slightly sericeous, hairs golden. *Thyrsi* sessile; main axis ca. 4.6 cm long; bracts ca. 1.7×0.6 mm, lanceolate, adaxial side glabrescent, abaxial side slightly sericeous; bracteoles ca. 1.2×0.4 mm, triangular, adaxial side glabrescent, abaxial side slightly sericeous; pedicels ca. 23.3×0.7 mm, sericeous; sepals ca. 2.8×2 mm, adaxial side glabrescent, abaxial side sericeous, ovate; glands broadly elliptic to obovate, ca. 2.1×1 mm; lateral petals blade ca. 5.5×5 mm, ovate; posterior petal blade ca. 4.3×4 mm, orbicular, margin fimbriate. *Stamens* connate at base; filaments ca. 4×0.3 mm, glabrous; anthers ca. 1.4×0.6 mm, glabrous; connectives ca. 1.4×0.5 mm. *Ovary* densely pubescent; styles ca. 4.5×0.3 mm, curved, glabrous. *Mericarps* with lateral wings ca. 15.5×6 mm, sericeous, dorsally undulate, carpophore ca. 6.7×0.3 mm, nut ca. 4.7×3 mm.

Specimens examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, estrada indo para o povoado de Cunha, $21^{\circ}07'21''$ S, $44^{\circ}18'07''$ W, 21.IX.2016, bud., fl., fr., *L.L. Alves 152* (HUFSJ).

Diplopterys pubipetala is distributed accros Amazon, Caatinga, Cerrado, Atlantic Forest and Pantanal domain im Brazil (Almeida 2020b). At the Lenheiro Mountain Range, this species is found in campos rupestres.

5. *Heteropterys* Kunth, Nov. Gen. Sp. (quarto ed.) 5: 163–167, pl. 450. 1821[1822].

Subshrubs or shrubs. *Stipules* epi- or interpetiolar, minute, free. *Leaves* opposite; petioles eglandular; blades broad glabrous or pubescent, glandular or not. *Thyrsi* or corymbs. *Sepals*, the lateral 2-glandular. *Petals* yellow, glabrous. *Stamens* 10, all fertile, homomorphic, free or connate at base; connectives not surpassing the anther sacs; anthers glabrous or pubescent. *Ovary* 3-carpellate, styles 3, truncates, stigmas lateral well developed. *Mericarps* with

developed dorsal wing, abaxially thickened, horizontally or obliquely or perpendicularly inserted in the nut, lateral wings or winglets reduced or absent, nut ovoid to round.

A total of 102 species are recorded from Brazil, where 33 species are known to occur in Minas Gerais (Pessoa *et al.* 2020), out of which only four are recorded from the Lenheiro Mountain Range.

Identification key to the species of *Heteropterys* at the Lenheiro Mountain Range

1. Trees; leaf blades eglandular; sepals revolute at anthesis.....2
1. Subshrubs or shrubs; leaf blades, 0-2-glandular near the base; sepals flat at anthesis..... 3
2. Leaf blades abaxially densely tomentose; bracteoles patent; stamens connate at base, anthers sericeous, ovary densely sericeous.....**5.1 *Heteropterys byrsonimifolia***
2. Leaf blades abaxially glabrous; bracteoles spreading; stamens free, anthers glabrous, ovary densely tomentose.....**5.2 *Heteropterys escalloniiifolia***
3. Leaf blades tomentose on both sides, margins flat; corymbs.....**5.3 *Heteropterys rubiginosa***
3. Leaf blades glabrescent on both sides, margins revolute; umbels.....**5.4 *Heteropterys umbellata***

5.1. *Heteropterys byrsonimifolia* A.Juss., Ann. Sci. Nat., Bot. II, 13: 276. 1840. Figure 4G.

Trees or treelets, 0.7–4 m tall. *Stipules* interpetiolar. *Leaf blades* 3.8–8.2 × 1.6–3.8 cm, narrowly elliptic to elliptic, base attenuate, margins flat, apex rounded or acuminate, adaxial side glabrous, abaxial side densely tomentose, eglandular; petioles 4.3–7.4 × 1.5 mm, sericeous, glabrescent. *Corymbs* 2-12-flowered; peduncle ca. 1.2 × 0.7 mm, densely

tomentose; main axis ca. 8.3 cm; bracts ca. 1.7×1 mm, ovate, adaxial side glabrous, abaxial side densely tomentose; bracteoles ca. 1.4×0.6 mm, ovate, patent; pedicels ca. 2.3×0.7 mm, densely tomentose; sepals ca. 2.8×1.4 mm, adaxial side slightly tomentose, glabrescent, abaxial side densely tomentose, ovate, revolute at anthesis; glands narrowly elliptic, ca. 1.5×0.8 mm; petals yellow, lateral petals blade ca. 3.3×2.8 mm, orbicular, claw ca. 2.8×0.3 mm, margins erose; posterior petal blade ca. 3.6×2.6 mm, orbicular, claw ca. 2.2×1 mm, margins erose. *Stamens* connate at base; filaments ca. 2.2×0.4 mm, glabrous; anthers ca. 0.9×0.4 mm, sericeous; connectives ca. 0.4×0.3 mm. *Ovary* densely sericeous; styles ca. 1.8×0.3 mm, glabrous; anterior stigma pointing towards the center of the flower, the posterior pointing towards the latero-posterior petals. *Mericarps* not seen, dorsal wing 12.7–30 mm long, tomentose, nut with inconspicuous lateral veins (Pessoa 2015).

Specimens examined: BRAZIL. Minas Gerais, São João del-Rei: Serra do Lenheiro, acesso por trilha pelo bairro Senhor dos Montes, $21^{\circ}12'64''$ S, $44^{\circ}27'27''$ W, 953 m, 6.X.2017, bud, fl., *M.T.R. Costa 1215* (HUFSJ); 15.IX.1897, bud., *F. Magalhães-Gomes s.n.* (OUPR 18578); estrada indo para o povoado de Cunha, arredores da Serra do Lenheiro, $21^{\circ}07'21''$ S, $44^{\circ}18'07''$ W, 985 m, 21.IX.2016, fl., *L.L. Alves 153* (HUFSJ).

Heteropterys byrsonimifolia is widely distributed across the Cerrado domain in Brazil (Pessoa *et al.* 2020). At the Lenheiro Mountain Range, this species is found in campos rupestres.

5.2. *Heteropterys escalloniifolia* A.Juss., Ann. Sci. Nat., Bot. II, 13: 276. 1840. Figure 4H.

Trees, ca. 4m tall. *Stipules* ca. 1.2×1 mm, epipetiolar, broadly elliptic. *Leaf blades* ca. 8.1×2.5 cm, narrowly elliptic, base attenuate, margins flat, apex acuminate, both sides glabrous, eglandular; petioles ca. 4.3×1.4 mm, slightly tomentose, glabrescent, eglandular. *Corymbs* many-flowered; peduncles ca. 2.6×0.8 mm, densely tomentose; main axis ca. 8.2 cm long;

bracts ca. 2.4×1.4 mm, ovate, adaxial tomentose, abaxial side densely tomentose; bracteoles ca. 2.1×1.1 mm, ovate, spreading; pedicels ca. 4.3×0.7 mm, densely tomentose; sepals ca. 2.2×1.5 mm, adaxial side glabrous, abaxial side tomentose, elliptic, revolute at anthesis; glands elliptic, ca. 1.4×0.6 mm; petals yellow, lateral petals blade ca. 2.7×2.8 mm, orbicular, claw ca. 3.3×0.3 mm, margins erose; posterior petal blade ca. 2.5×2 mm, broadly elliptic, claw ca. 3.3×0.4 mm, margins erose. *Stamens* free; filaments ca. 2.4×0.2 mm, glabrous; anthers ca. 0.9×0.7 mm, glabrous; connectives ca. 0.6×0.4 mm. *Ovary* densely tomentose; styles heteromorphic, ca. 3.3×0.3 mm, glabrous; stigmas pointing towards the posterior petal. *Mericarps* not seen, dorsal wing 15.3–23.2 mm long, tomentose, nuts with inconspicuous lateral veins (Pessoa 2005).

Specimen examined: BRAZIL. Minas Gerais, São João del-Rei: Serra do Lenheiro, estrada indo para o povoado de Cunha, $21^{\circ}07'21''$ S, $44^{\circ}18'07''$ W, 985 m, 21.IX.2016, fl., *L.L. Alves 153* (HUFSJ).

Heteropterys escalloniifolia is distributed across the Cerrado and Caatinga domain in Brazil (Pessoa *et al.* 2020). At the Lenheiro Mountain Range, this species is found in campos rupestres.

5.3. *Heteropterys rubiginosa* A.Juss., Ann. Sci. Nat., Bot. II, 13: 278. 1840. Figure 4I

Shrubs ca. 0.5 m tall. *Stipules* ca. 2.3×1.4 mm, epipetiole, ovate. *Leaf blades* ca. 6×3.1 cm, elliptic to obovate, base attenuate, margins flat, apex mucronulate to apiculate, adaxial side tomentose, abaxial side densely tomentose, 2-glandular near the base; petioles ca. 5.3×1.1 mm, densely tomentose, eglandular. *Corymbs* many-flowered; peduncle ca. 2.2×0.6 mm, densely tomentose; bracts ca. 2.1×0.5 mm, lanceolate, adaxial side slightly tomentose, abaxial side densely tomentose; bracteoles ca. 1.1×0.4 mm, lanceolate, patent; pedicels ca.

6.8 × 0.5 mm, tomentose; sepals ca. 3.3 × 1.6 mm, adaxial side glabrous, abaxial side tomentose, ovate, flat at anthesis; glands narrowly elliptic, ca. 1.8 × 0.7 mm; petals yellow, lateral petals blade ca. 5 × 3.5 mm, ovate, claw ca. 2 × 0.5 mm, margins entire to crenulate; posterior petal blade ca. 5.2 × 4.2 mm, broadly elliptic to ovate, claw ca. 1.4 × 0.6 mm, margins crenulate. *Stamens* connate at base; filaments ca. 2.5 × 0.2 mm, glabrous; anthers ca. 1.2 × 0.6 mm, glabrous; connectives ca. 0.8 × 0.4 mm. *Ovary* sericeous; styles ca. 2.2 × 0.2 mm, glabrous; stigmas turned all to the same side of the flower. *Mericarps* with dorsal wing ca. 15 × 5.7 mm, densely tomentose, green to red, calyx and styles persistent.

Specimens examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, trilha para paredão rochoso, entrada na estrada para Cunha, 21°11'69" S, 44°28'88" W, 1054 m, 04.XII.2018, fl., fr., *M.T.R. Costa* 1554 (HUFJSJ).

Heteropterys rubiginosa is distributed across the Amazon, Caatinga, Cerrado domain in Brazil (Pessoa *et al.* 2020). At the Lenheiro Mountain Range, this species is found in campos rupestres.

5.4. *Heteropterys umbellata* A.Juss., Fl. Bras. Merid. (quarto ed.) 3(21): 25, pl. 166.

1832[1833]. Figure 5A-B.

Subshrubs or shrubs 0.4–1.3 m tall. *Stipules* ca. 0.6 × 0.4 mm, epipetiolar, triangular. *Leaf blades* 2–13 × 13–6.7 cm, elliptic, base rounded to attenuate, margins revolute, apex rounded, both sides glabrescent, 0-2-glandular near the base; petioles ca. 2 × 0.5 mm, sericeous. *Umbels* 7-5-flowered; peduncle ca. 1.4 × 0.4 mm, sericeous; bracts ca. 1.1 × 0.4 mm, ovate, adaxial side glabrous, abaxial side slightly sericeous; bracteoles ca. 0.7 × 0.4 mm, ovate, patent; pedicels 2.2–4.8 × 0.3–0.4 mm, slightly sericeous; sepals ca. 1.4–2 × 0.8–1.1 mm, adaxial side glabrous, abaxial side slightly sericeous, ovate, flat at anthesis; glands obovate,

ca. 1×0.7 mm; petals yellow, lateral petals blade ca. 2.7×2.2 mm, obovate, claw ca. 1.6×0.4 mm, margins crenulate; posterior petal blade ca. 2×1.9 mm, orbicular, claw ca. 2.3×1.2 mm, margins erose. *Stamens* connate at base; anthers ca. 0.7×0.6 mm, glabrous; connectives $1.4\text{--}2 \times 0.3$ mm. *Ovary* sericeous; styles ca. 2.2×0.3 mm, glabrous. *Mericarps* not seen, winglets ca. 1.5 cm long, ascending, and smooth nut (Mamede 1987).

Specimens examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, morro do lado esquerdo às águas férreas, $21^{\circ}13'64''$ S, $44^{\circ}27'93''$ W, 981 m, 17.IX.2017, bud., *M.T.R. Costa 1142* (HUFSJ); acesso pelo Senhor dos Montes, $21^{\circ}12'90''$ S, $44^{\circ}27'61''$ W, 1063 m, 3.III.2018, fl., *M.T.R. Costa 1406* (HUFSJ); subida pela parte de trás da igreja São José, $21^{\circ}07'39''$ S, $44^{\circ}17'21''$ W, 1020 m, 16.X.2015, bud., fl., *L.L. Alves 44* (HUFSJ, HUESB); $21^{\circ}14'07''$ S, $44^{\circ}29'28''$ W, 1085 m, 13.III.2015, bud., fl., *M.T.R. Costa 401* (HUFSJ).

Heteropterys umbellata is distributed across the Cerrado and Atlantic forest (Pessoa *et al.* 2020). At the Lenheiro Mountain Range, this species is found in campos rupestres.

6. *Mascagnia* (Bertero *ex* DC.) Bertero, Hortus Ripulensis 85. 1824.

Lianas. *Stipules* epipetiolar, minute, free. *Leaves* opposite; petiole glandular; blades broad pilose, glandular. *Thyrsi* with 1–2-flowered cincinni. *Sepals* all 2-glandular. *Petals* pink, glabrous. *Stamens* 10, all fertile; connectives not surpassing the anther sacs; anthers glabrous. *Ovary* 3-carpellate, styles 3, capitate, stigmas terminal well developed. *Mericarps* with dorsal wing reduced to a winglet, lateral wings fused into an orbicular structure, membranous, velutine.

Mascagnia is represented by 19 species in Brazil, where four are known to occur in Minas Gerais (Almeida 2020c) and one at the Lenheiro Mountain Range.

6.1. *Mascagnia cordifolia* (A. Juss.) Griseb., Fl. Bras. 12(1): 95. 1858. Figure 5C-D.

Lianas. *Stipules* 2.1–4.4 × 0.8–1.2 mm. *Leaf blades* 4.9–11.7 × 3.5–9.5 cm, broadly elliptic to ovate, base slightly cordate to cordate, margins flat to slightly revolute, apex acute to caudate, both sides densely velutine, 0-2-7-glandular, glands impressed on both sides of the blade between the primary vein and the margins; petioles 23.2–9 × 1.5–1.7 mm, densely velutine, 1-glandular at the base near the insertion with the stem. *Thyrsi* many-flowered; peduncle 3.6–7.4 × 0.4–0.7 mm; main axis ca. 6–12.3 cm; bracts 1.6–2.8 × 0.4–1 mm, lanceolate, both sides densely velutine; bracteoles 1.7–2.4 × 0.6–1 mm, generally one bigger than the other with a basal gland; pedicels 2–7.5 × 0.6 mm, densely velutine; sepals ca. 2.8 × 2 mm, adaxial side glabrescent, abaxial side velutine, triangular to ovate; glands obovate, ca. 2 × 1.3 mm; lateral petals blade ca. 5.5 × 4.3 mm, elliptic, claw ca. 1.2 × 0.5 mm, margins denticulate; posterior petal blade ca. 5 × 4.2 mm, broadly elliptic, base cordate, claw ca. 1.7 × 0.5 mm, margins erose. *Stamens* connate at base, homomorphic; filaments ca. 2.3 × 0.7 mm, glabrous; anthers ca. 1.8 × 0.9 mm; connectives ca. 1.3 × 0.6 mm. *Ovary* sericeous; styles homomorphic, glabrous. *Mericarps* lateral wing ca. 20 × 23 mm, orbicular, membranous, velutine.

Specimens examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, base da serra, 21.VII.1973, bud., fl., *J. Badini s.n.* (OUPR 24170); estrada para o povoado de Cunha, 21°05'42" S, 44°16'01" W, 928 m, 21.IX.2016, bud., fl., fr., *L.L. Alves 113* (HUFJSJ).

Mascagnia cordifolia is widely distributed across Amazon, Caatinga, Cerrado, Atlantic Forest domain in Brazil (Almeida 2020c). At the Lenheiro Mountain Range, this species is found in vegetation over campos rupestres.

7. *Niedenzuella* W.R.Anderson, Novon 16(2): 194–198. 2006.

Lianas. *Stipules* epipetiolar, minute, free. *Leaves* opposite; petiole eglandular; blades broad pilose, eglandular. *Thyrsi* arranged in thyrsi. *Sepals* the lateral 2-glandular. *Petals* yellow, glabrous. *Stamens* 10, all fertile; connectives not surpassing the anther sacs; anthers glabrous. *Ovary* 3-carpellate, styles 3, apex truncate, stigmas lateral well developed. *Mericarps* dorsal wing reduced into a winglet, lateral wings X-shaped.

Niedenzuella is represented by 13 species in Brazil, where six are found in Minas Gerais (Almeida 2020d) and one at the Lenheiro Mountain Range.

7.1. *Niedenzuella warmingiana* (A.Juss.) W.R.Anderson, Novon 16(2): 202. 2006. Figure 5E.

Liana. *Leaf blades* ca. 3.8×1.4 cm, elliptic, base attenuate, margins flat, apex mucronulate to acuminate, adaxial side slightly sericeous, abaxial side densely sericeous, eglandular; petioles ca. 2.7×0.8 mm, densely sericeous, eglandular. *Thyrsi* many-flowered; peduncle ca. 1.4×0.4 mm, sericeous; bracts ca. 1.9×0.6 mm, triangular, adaxial side slightly tomentose, glabrescent, abaxial side densely tomentose; bracteoles ca. 1.3×0.4 mm, ovate, spreading; pedicels ca. 5.2×0.6 mm, sericeous; sepals ca. 4×0.7 mm, adaxial side glabrous, abaxial side sericeous, ovate, revolute at anthesis; glands ca. 2×1 mm, narrowly elliptic to obovate; petals yellow, lateral petals blade ca. 4.2×2.8 mm, elliptic, claw ca. 2.2×0.4 mm, margins erose; posterior petal blade ca. 2.8×2.6 mm, orbicular, claw ca. 2.6×0.5 mm, margins crenate. *Stamens* connate at base, homomorphic; filaments ca. 1.6×0.4 mm, glabrous; anthers ca. 1.2×0.7 mm; connectives ca. 0.6×0.4 mm. *Ovary* densely tomentose; styles 3, ca. 2.1×0.3 mm, heteromorphic, glabrous, 2 straight, 1 slightly arcuate; stigmas 2 pointing towards one side of the flower, 1 pointing to the opposite direction. *Mericarps* not seen.

Specimen examined: BRAZIL. Minas Gerais, São João del-Rei, Serra do Lenheiro, estrada indo para o povoado de Cunha, 21°05'41" S, 44°16'07" W, 909 m, 21.IX.2016, bud., fl., *Alves, L.L. 167* (HUFJSJ).

Niedenzuella warmingiana is distributed across the Cerrado domain at the Minas Gerais state in Brazil (Almeida 2020d). At the Lenheiro Mountain Range, this species is found in vegetation over campos rupestres.

8. *Peixotoa* A.Juss., Fl. Bras. Merid. (quarto ed.) 3(22): 59. 1832[1833].

Shrubs or subshrubs. *Stipules* interpetiolar, expanded, basally connate, triangular. *Leaves* opposite; petioles glandular or not; blades pilose, glandular. *Umbels* solitary or arranged in dichasia or thyrsi. *Sepals* the laterals 2-glandular. *Petals* yellow, glabrous. *Stamens* 5, fertile, staminodes 5; connectives not surpassing the anther sacs; anthers glabrous. *Ovary* 3-carpellate, styles 3, stigma terminal, capitate. *Mericarps* dorsal wing expanded, thickened adaxially, dorsal wings reduced to winglets.

A total of 28 species of *Peixotoa* are recognized in Brazil, with 14 occurring in Minas Gerais (Almeida 2020e) and two at the Lenheiro Mountain Range.

Identification key for the species of *Peixotoa* from the Lenheiro Mountain Range

1. Leaf blades with minutely denticulate margins, petioles densely tomentose; umbels solitary; anther sacs always closed, never releasing pollen grains.....**8.1 *Peixotoa reticulata***

1. Leaf blades entire, petioles densely velutine; umbels arranged in dichasia; anther sacs opening, releasing pollen grains.....**8.2 *Peixotoa tomentosa***

8.1. *Peixotoa reticulata* Griseb., *Linnaea* 13: 213. 1839. Figure 5G.

Subshrubs or shrubs, 25–60 cm tall. *Stipules* ca. $7 \times 7.8\text{--}8.9$ mm. *Leaf blades* $3.8\text{--}10.8 \times 2.7\text{--}7.4$ cm, elliptic to broadly elliptic to obovate to orbicular, base cordate to rounded to attenuate, margins flat, minutely denticulate, apex apiculate to acuminate, adaxial side velutine, abaxial side sparsely tomentose, 0-2-glandular near the first pair of secondary veins; petioles ca. 3.9×1.4 mm, densely tomentose, 0-2-glandular just below the blade. *Umbels* 4-12-flowered, solitary; peduncle absent; bracts ca. 0.7×1.1 mm, triangular, adaxial side glabrous, abaxial side tomentose; bracteoles ca. 0.2×0.3 mm, triangular; pedicels $7\text{--}11.8 \times 0.7$ mm, densely tomentose; sepals ca. 5.6×3.5 mm, ovate; glands broadly elliptic; lateral petals blade ca. 7.9×9.1 mm, orbicular to broadly elliptic to cordate, claw ca. 2.3×0.7 mm, margins erose; posterior petal blade ca. 4.7×3.8 mm, orbicular to broadly elliptic, claw ca. 3.9×1.7 mm, margins fimbriate, glandular. *Stamens* free; filaments ca. 3.2×0.5 mm, glabrous; anthers ca. 1.5×1.4 mm, glabrous, anther sacs always closed, never releasing pollen grains; connectives ca. 1.2×0.6 mm. *Ovary* sericeous; styles glabrous. *Mericarps* not seen, dorsal wings $1.3\text{--}2 \times 0.9\text{--}1.3$ cm, velutine, nuts $4\text{--}7.5 \times 0.3\text{--}0.6$ mm and smooth (Anderson 1982).

Specimens examined: BRAZIL. Minas Gerais. São João del-Rei: Serra do Lenheiro: trilha à esquerda da principal que leva à torre, $21^{\circ}09'29''$ S, $44^{\circ}18'05''$ W, 1056 m, 22.V.2015, bud., fl., *L.L. Alves 39* (HUFSJ); trilha à esquerda da principal que leva à torre, $21^{\circ}09'29''$ S, $44^{\circ}18'05''$ W, 1056 m, 22.V.2015, fl., *L.L. Alves 37* (HUFSJ); subida pelo Tijuco, $21^{\circ}13'87''$ S, $44^{\circ}28'23''$ W, 967 m, 12.XII.2014, fl., *M.T.R. Costa 260* (HUFSJ); estrada que chega na torre, sob pedras, $21^{\circ}09'21''$ S, $44^{\circ}18'20''$ W, 957 m, 10.IV.2015, bud., fl., *L.L. Alves 20* (HUFSJ).

Peixotoa reticulata is distributed across the Cerrado and Atlantic Forest domain in Brazil (Almeida 2020e). At the Lenheiro Mountain Range, this species is found at the campos rupestres.

Peixotoa reticulata is an apomictic species, where the anthers sacs remain closed and, when they eventually open, pollen fertility is reduced to only 3-20% (Anderson 1982).

8.2. *Peixotoa tomentosa* A.Juss., Fl. Bras. Merid. (quarto ed.) 3(22): 61. 1832[1833]. Figure 5F.

Subshrubs or shrubs, 40–150 cm tall. *Stipules* 3.6–8.5 × 3.9–6.7 mm. *Leaf blades* 2.2–8.7 × 1.1–6.2 cm, elliptic to broadly ovate, cordate to orbicular, base attenuate to cordate, margins flat, entire, apex acuminate, adaxial side velutine, abaxial side densely velutine with golden hairs, 0-2-glandular near the first pair of secondary veins; petioles 1.8–6.6 × 1.2–1.8 mm, densely velutine, 0-2-glandular just below the blade. *Umbels* 4-12-flowered, arranged in dichasia; peduncle absent; bracts ca. 1 × 0.8 mm, triangular, adaxial side tomentose, abaxial side densely tomentose; bracteoles ca. 0.5 × 0.2 mm, triangular; pedicels 14.2–21 × 0.6–1 mm, densely velutine with golden hairs; sepals 4–5.3 × 2.7–3 mm, ovate; glands ovate, ca. 1.9 × 1.2 mm; lateral petals blade 9.4–12.4 × 7.8–11.7 mm, orbicular to broadly elliptic to cordate, claw 2.4–2.8 × 0.5–1.3 mm, margins fimbriate, glandular or not; posterior petal blade 7.7–9.3 × 5.4–7.9 mm, broadly elliptic to orbicular, claw 2–3.7 × 0.8–1.7 mm, margins fimbriate, densely glandular. *Stamens* free; filaments 3.2–4.1 × 0.3–0.5 mm, glabrous; anthers 1–1.6 × 0.6–0.8 mm, glabrous, anther sacs always opening, releasing pollen grains; connectives ca. 0.7 × 0.4 mm. *Ovary* sericeous; styles glabrous. *Mericarps* with dorsal wing ca. 20 × 12 mm, margins arcuate, lateral wing ca. 2 × 9 mm, semicircular, areole ca. 3.2 × 3.8 mm.

Specimens examined: BRASIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, próximo às torres de transmissão, 21°15'79" S, 44°31'06" W, 1139 m, 27.I.2018, bud., fl., *M.T.R. Costa 1346* (HUFSJ); estrada que chega à torre, 21°09'21" S, 44°18'20" W, 957 m, 10.IV.2015, bud., fl., *L.L. Alves 19* (HUFSJ); acesso às torres de transmissão, 21°15'73" S, 44°30'02" W, 1080 m, bud., fl., *M.T.R. Costa 864* (HUFSJ); estrada para Trindade, 21°14'10" S, 44°28'67" W, 992 m, 26.IV.2017, fl., *M.T.R. Costa 901* (HUFSJ); atrás da base do exército, 21°15'25" S, 44°30'55" W, 1128 m, 11.VIII.2017, fl., *M.T.R. Costa 1106* (HUFSJ); à esquerda a trilha principal que leva à torre, 21°09'29" S, 44°18'05" W, 1056 m, 22.V.2015, fl., fr., *L.L. Alves 38* (HUFSJ).

Peixotoa tomentosa is widely distributed across the Cerrado domain in Brazil (Almeida 2020e). At the Lenheiro Mountain Range, this species is found at the campos rupestres.

9. *Tetrapteryx* Cav., Diss. 9: 433. 1790.

Shrubs. *Stipules* epipetiolar, minute, free. *Leaves* opposite; petiole glandular or not; blades broad pilose, eglandular. *Thyrsi*, cincinni sessile. *Sepals* the laterals 2-glandular. *Petals* yellow, glabrous. *Stamens* 10, all fertile; connectives not surpassing the anther sacs; anthers glabrous. *Ovary* 3-carpellate; styles 3, apex truncate, stigmas lateral well developed. *Mericarps* dorsal wing reduced into a winglet, lateral wings X-shaped.

A total of 32 species of *Tetrapteryx* are recorded from Brazil, with 13 listed for Minas Gerais (Almeida 2020f) and one at the Lenheiro Mountain Range.

9.1. *Tetrapteryx ramiflora* A. Juss. in. A. St-Hil. Fl. Bras. Mer. 3: 8. 1832. Figure 5H-I.

Shrubs, 1–2,5 m tall. *Stipules* 2.1 × 0.6 mm, lanceolate. *Leaf blades* 3.5–8 × 1.2–3.4 cm, elliptic, base attenuate, margins flat, apex acuminate, both sides densely tomentose, eglandular; petioles ca. 3.5 × 1.2 mm, densely tomentose, eglandular. *Thyrsi* many-flowered, congested at stem; peduncle ca. 2.2 × 0.6 mm, tomentose; bracts ca. 2 × 0.8 mm, lanceolate, adaxial side glabrescent, abaxial side tomentose; bracteoles ca. 1.8 × 0.4 mm, lanceolate, 2-glandular, spreading; pedicels ca. 6.5 × 0.6 mm, tomentose; sepals ca. 4.2 × 1.6 mm, adaxial side glabrous, abaxial side tomentose, ovate, revolute at anthesis; glands ca. 2 × 0,7 mm, elliptic; lateral petals yellow, with 2 red stripes, blade ca. 6.5 × 5 cm, orbicular, claw ca. 2.8 × 0.7 mm, margins erose; posterior petal yellow, blade ca. 7.8 × 4.4 cm, elliptic, claw ca. 2.7 × 0.9 mm, margins erose. *Stamens* connate at base, heteromorphic; filaments ca. 2 × 0.2 mm, glabrous; anthers ca. 0.8 × 0.6 mm; connectives ca. 0.5 × 0.4 mm. *Ovary* densely velutine; styles ca. 3 × 0.3 mm, glabrous. *Mericarps* superior lateral wings ca. 5.5 × 5.7 mm, inferior lateral wings ca. 7.3 × 5.2 mm, nut smooth, calyx persistent.

Specimens examined: BRASIL. Minas Gerais. São João del-Rei: Serra do Lenheiro, estrada para o povoado de Cunha, 21°05'42" S, 44°16'01" W, 928 m, 21.IX.2016, fr., *L.L. Alves 112* (HUFSJ); estrada para o Fé, 21°06'26" S, 44°19'04" W, 955 m, 16.X.2018, fl., fr., *L.L. Alves 240* (HUFSJ).

Tetrapteryx ramiflora is widely distributed across the Caatinga, Cerrado, Atlantic Forest domain in Brazil (Almeida 2020f). At the Lenheiro Mountain Range, this species is found at the campos rupestres.

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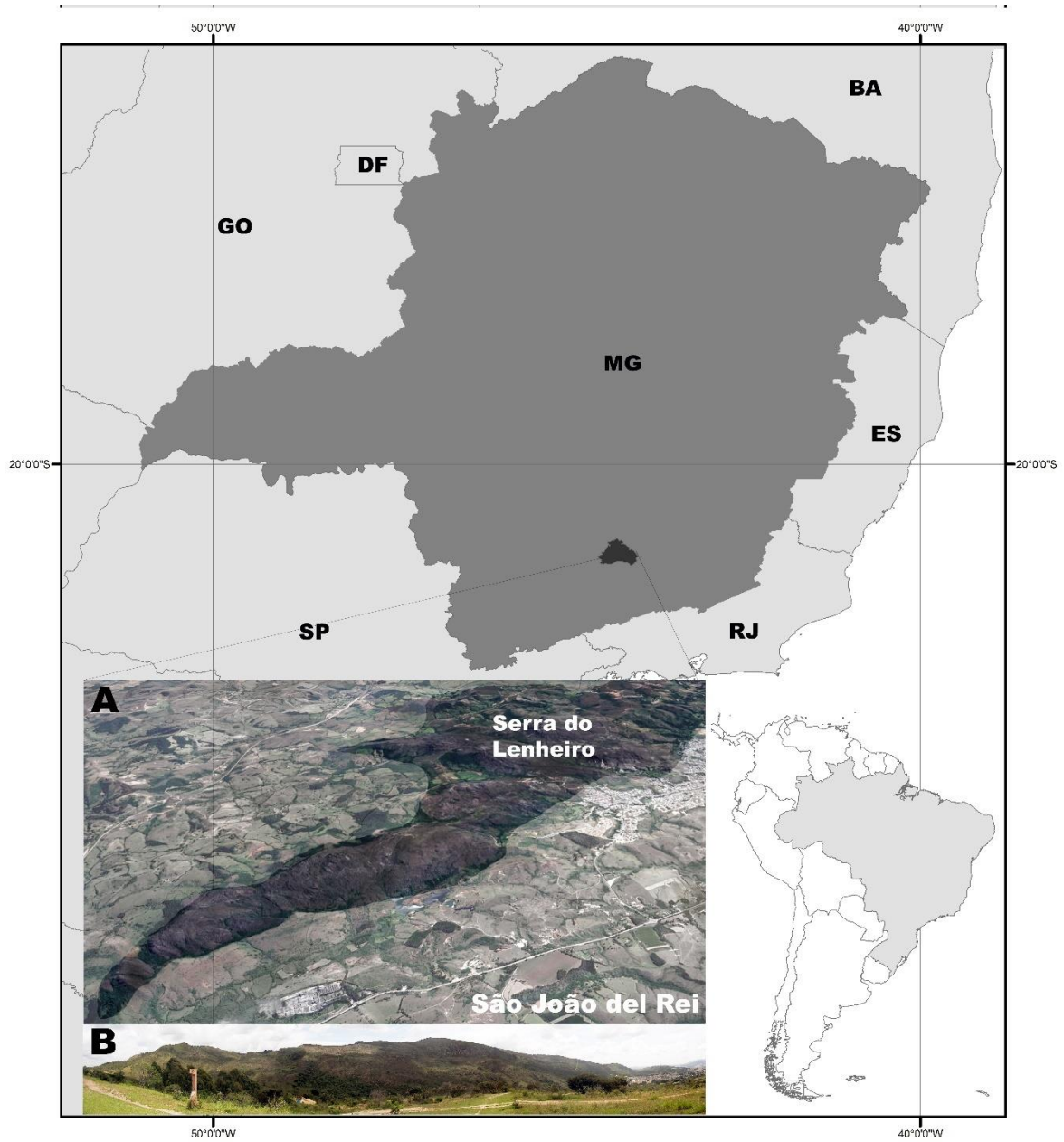


Figure 1 – Map locating the Lenheiro Range in Brazil: A. satellite view of the Lenheiro Range, in black, B. in situ view of the Lenheiro Range.

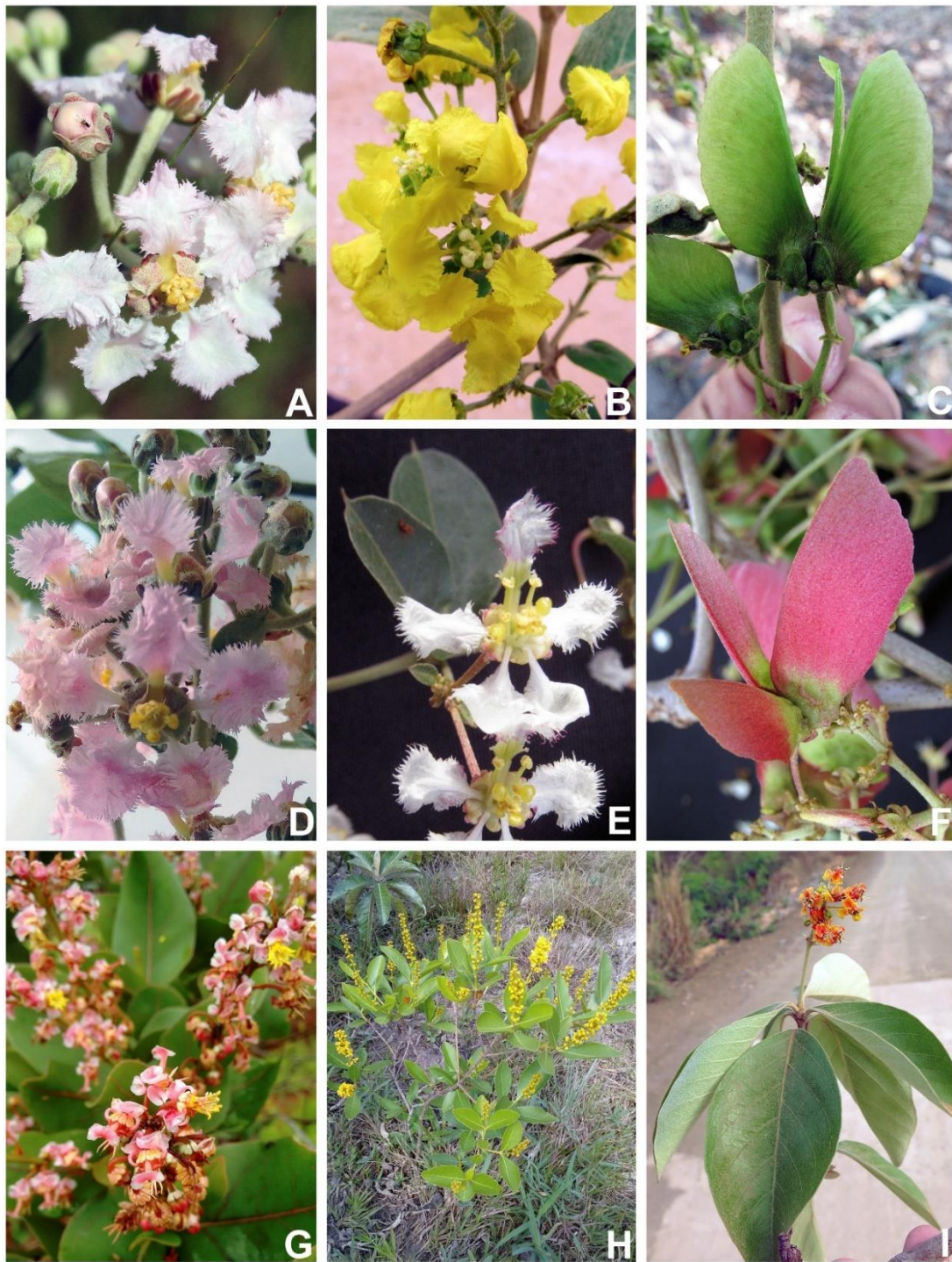


Figure 2 – Flowering and fruiting branches of *Banisteriopsis* and *Byrsonima* at the Lenheiro Range: A. *Banisteriopsis campestris*, B–C. *Banisteriopsis gardneriana*, D. *Banisteriopsis malifolia*, E–F. *Banisteriopsis muricata*, G. *Byrsonima coccolobifolia*, H. *Byrsonima intermedia*, and I. *Byrsonima pachyphylla* (photos A–H by L.L.Alves, and I by R.F.Almeida).

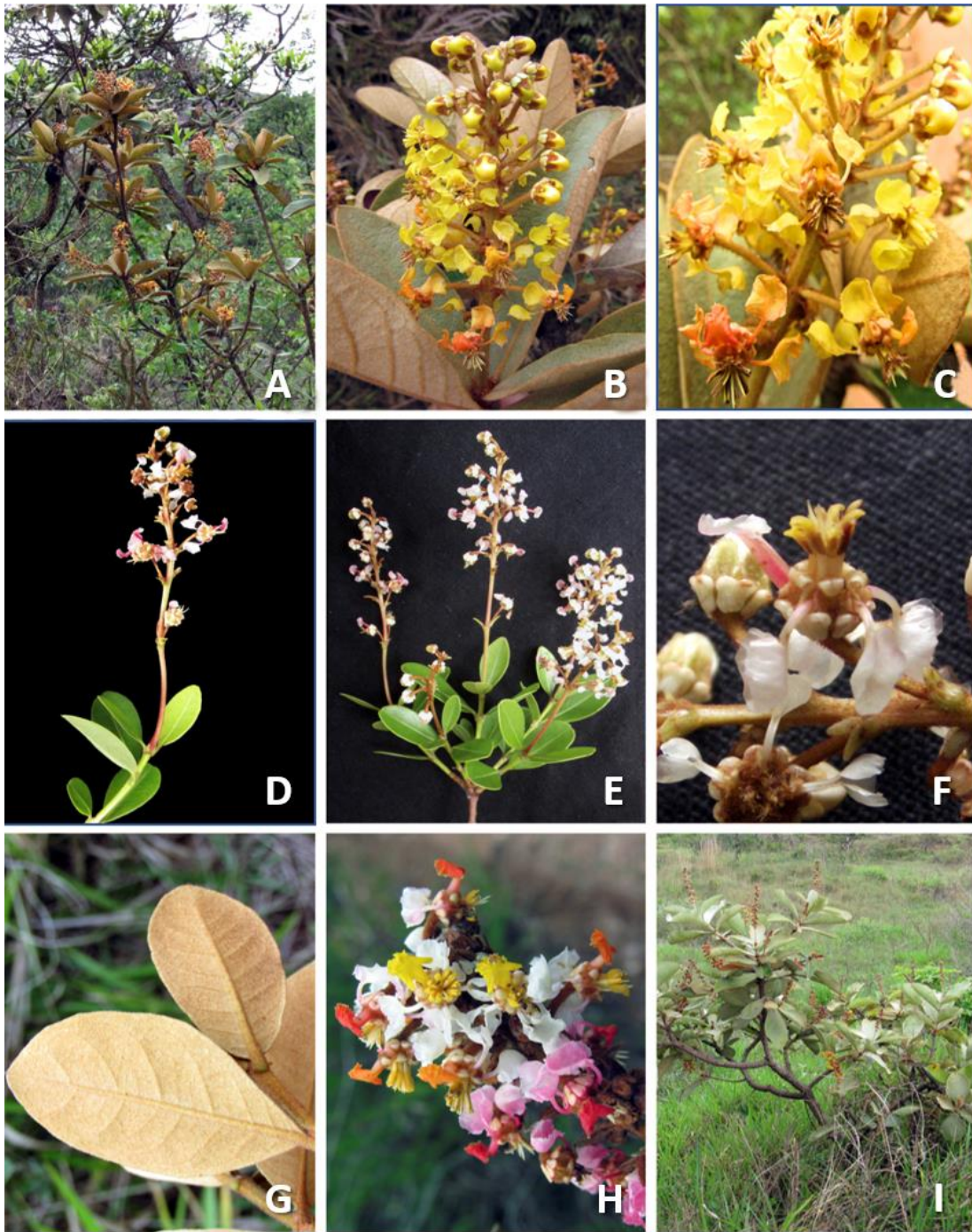


Figure 3 – Flowering and fruiting branches of *Byrsonima* at the Lenheiro Range: A–C. *Byrsonima stannardii*, D–F. *Byrsonima vacciniifolia*, G–H. *Byrsonima variabilis*, and I. *Byrsonima verbascifolia* (photos A-C and G-I by L.L.Alves, and D-F by R.F.Almeida).



Figure 4 – Flowering and fruiting branches of *Byrsonima*, *Camarea*, *Diplopterys*, and *Heteropterys* at the Lenheiro Range: A. *Byrsonima verbascifolia*, B–C. *Camarea affinis*, D. *Camarea ericoides*, E–F. *Diplopterys pubipetala*, G. *Heteropterys byrsonimifolia*, H. *Heteropterys escalloniifolia*, and I. *Heteropterys rubiginosa* (photos A–I by L.L.Alves).



Figure 5 – Flowering and fruiting branches of *Heteropterys*, *Mascagnia*, *Niedenzuella*, *Peixotoa*, and *Tetrapteryx* at the Lenheiro Range: A–B. *Heteropterys umbellata*, C–D. *Mascagnia cordifolia*, E. *Niedenzuella warmingiana*, F. *Peixotoa tomentosa*, G. *Peixotoa reticulata*, and H–I. *Tetrapteryx ramiflora* (photos A–I by L.L.Alves).

**ARTIGO 02: *BYRSONIMA* (MALPIGHIACEAE) FROM ESPÍRITO SANTO STATE,
BRAZIL**

**NORMAS DO PERIÓDICO PHYTOTAXA (VERSÃO ACEITA PARA
PUBLICAÇÃO)**

***Byrsonima* (Malpighiaceae) from Espírito Santo state, Brazil**

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Abbreviated title: *Byrsonima* (Malpighiaceae) from Espírito Santo state, Brazil

Abstract

We present a floristic survey for *Byrsonima* (Malpighiaceae) from Espírito Santo state, Brazil. Of the 17 species occurring in Espírito Santo, one is recorded for the first time for the state (*B. intermedia*). In addition, three species were considered vulnerable or near threatened (*B. alvimii*, *B. bahiana* and *B. cacaophila*). Identification key for all species was presented, along with morphological descriptions, photograph plates, distribution maps, and ecological notes of the studied species.

Keywords:—southeastern Brazil, Byrsonimoid clade, Taxonomy, Malpighiales, South America.

Introduction

Malpighiaceae is one of the 36 families currently placed in Malpighiales (APG IV 2016). It comprises 77 genera and ca. 1300 species of trees, shrubs, subshrubs, or lianas, distributed in the tropics worldwide, but predominantly in the Neotropics (Davis & Anderson 2010).

One of the largest genera of Malpighiaceae is *Byrsonima* Richard ex Kunth (1822: 147), with approximately 135 Neotropical species found mainly in humid forests and savannas (Anderson *et al.* 2006). *Byrsonima* species are shrubs or trees devoid of extra-floral nectaries, with terminal erect inflorescences arranged in 1-flowered cincinnus, calyces with ten elaiophores (or rarely absent), ten stamens, petals glabrous, white, yellow or pink, three subulate styles, and drupaceous fruits (Anderson 1981, Mamede 1987, Francener 2016). *Byrsonima* has so far been considered as monophyletic, having as close genera *Blepharandra*

Grisebach (1849: 7) and *Diacidia* Grisebach (1858: 119), on a clade called byrsonimoids (Davis & Anderson 2010).

Byrsonima species can be important as human resource. The best known would be its importance as food. Species such as *Byrsonima crassifolia* (Linnaeus 1753: 426) Kunth (1822: 149), occurring from Paraguay to Mexico (Anderson 1978), had populations sometimes cultivated in farms, for extractive production, especially in northern and northeastern Brazil, where it is much appreciated, either naturally or in the form of jams, juices, or ice creams (Rego & Albuquerque 2006). Some species of *Byrsonima* are widely used in traditional medicine as having antimicrobial, antioxidant, and anti-inflammatory activities (Guilhon-Simplicio & Pereira 2011), also used for the treatment of infection and diarrhea (Panizza 1998). Even if there is no record of consumption on an industrial scale, wood is suitable for construction. The bark of some species is astringent and can be used in tannery (15-20% tannin), and the black ink extracted from the bark for dyeing, giving the gray color to cotton (Alberto *et al.* 2011).

Brazil is the country with the largest number of *Byrsonima* species, having 99 recognized species (Francener 2020). The Cerrado and Amazon domains are the most diverse (ca. 50 species), followed by the Atlantic Forest, with ca. 30 species (Mamede *et al.* 2015). Within the Atlantic Forest domain, Espírito Santo can be recognized as a large area of distribution for *Byrsonima*, having ca. 20 species previously recorded (Almeida & Mamede 2014). The vegetation cover of Espírito Santo, practically all covered by the Atlantic Forest in the past, has a history of devastation whose records go back to those of the beginning of its colonization (Silva 1986). In this sense, studies aiming at expanding the knowledge of the flora of Espírito Santo must be encouraged and implemented, enabling public agencies and organized society to formulate proposals aiming at the conservation of the remaining plants. Moreover, despite its small size, the state continues to reveal a great diversity not yet known.

To further understand the floristic of Espírito Santo state, we present a taxonomic treatment for *Byrsonima*, including a key for identifying species, morphological descriptions, specimens examined, photograph plates, and comments on distribution and taxonomy of all species.

Material and Methods

Study area

The Atlantic Forest of Espírito Santo has the largest diversity of *Byrsonima* species in this phytogeographic domain (Simonelli & Fraga 2007). Together with the fragments occurring in the state of Bahia, the Atlantic Forest of Espírito Santo is part of the central corridor of the Atlantic Forest, holding the world record for tree diversity per hectare (Thomaz & Monteiro 1997) and a high number of endemic species for several groups (Soderstrom et al. 1988), including woody plants (Prance 1982). This is partly due to the different physiognomies found in the state, shaped by altimetric, geomorphological, pedological, and climatological variations. However, the existing biodiversity in the Atlantic Forest of Espírito Santo is strongly threatened, having suffered the most from the reduction of natural areas in the last 30 years (Simonelli & Fraga 2007). Espírito Santo has ca. 685 endangered species, 23 from Malpighiaceae and four *Byrsonima* (Simonelli & Fraga 2007).

Taxonomy

We analyzed 131 specimens from physical (labeled with an exclamation mark, “!”) and virtual herbaria, namely BHCB, RB, CVRD, MBM, MBML, and VIES (acronyms according to Thiers 2021). Morphological terminology for vegetative characters followed the one reported by Radford *et al.* (1974), and for reproductive characters, the terminologies reported by Niedenzu (1928) and Anderson (1981) were followed. The terminology adopted for trichomes comply with the one introduced by Anderson (1981), a nomenclature applied in

Malpighiaceae according to the definition proposed by Niedenzu (1928), who performed the latest taxonomic revision for the family. The description of the genus included only the variations found in the study area. The measurement results were taken according to the standard length x width (or diameter) measurement procedure.

If only a maximum of three specimens were available, the final result was presented simply as the mean value of all three measurements. If more than three specimens were available, the final result was calculated by taking the mean value between the smallest and the largest value observed. Species were described in alphabetical order. All figures were processed using Photoshop and Power Point.

We recorded 17 *Byrsonima* species in Espírito Santo. A previous study recorded 20 *Byrsonima* species in the state (Almeida & Mamede 2014). The online platform speciesLink (2020) listed 25 *Byrsonima* species; whereas Flora of Brazil listed 21 species (Flora of Brazil 2020). Some species were excluded from our analysis and are discussed at the end of this paper.

Results and discussion

Byrsonima Richard ex Kunth (1822: 147).

Trees, shrubs or subshrubs, branches aerial or underground. *Stipules* epipetiolar free or connate. *Leaves* opposite; petioles eglandular; blades glabrous or pilose, eglandular, with V-, Y-, T- or star-shaped trichomes. *Thyrse* sessile or pedunculate, cincinnus 1–2-flowered. *Sepals* all 2-glandular. *Petals* yellow to orange or red, pink or white, glabrous. *Stamens* 10, all fertile, free or connate at base, pilose at base; connectives glandular, surpassing or not the pollen sacs, anthers sericeous to glabrous. *Ovary* glabrous or sericeous, styles 3, glabrous,

apex acute, 3 terminal stigmas. *Drupes*, exocarp fleshy, green when immature, yellow or red when mature.

Key to the species of *Byrsonima* in Espírito Santo state

1. Leaves glabrous to glabrescent on both sides, with few or no trichomes in the midrib or lateral ribs, abaxial side glabrous to glabrescent, with a few sericeous hairs in midrib, adaxial side glabrous2
- Leaves tomentose, velutine or sericeous on both sides or abaxially.....13
2. Anthers glabrous to glabrescent.....3
- Anthers sericeous.....7
3. Stipules up to 2.3 mm long; main axis of inflorescence up to 5.6 mm long4
- Stipules longer than 2.2 mm long; main axis of inflorescence longer than 5.6 mm long.....5
4. Floral rachis glabrous, bearing ca. 20 flowers; ovary glabrous to sericeous, leaves obovate, oblong to elliptical, all the petals white to pink becoming red with age.....*B. myricifolia*
- Floral rachis sericeous, bearing ca. 50 flowers; ovary glabrous; leaves narrowly elliptical to lanceolate; lateral petals white becoming pink in age and posterior petal or claw of posterior petal yellow, becoming red with age.....*B. ligustrifolia*
5. Leaves elliptical; apex acute, acuminate falcate to rounded.....*B. perseifolia*
- Leaves obovate to widely elliptical; apex rounded to retuse.....6

6. Petiole ca. 13 mm; connectives slightly surpassing the anther sacs (ca. 0.1 mm length);
 accrescent sepals on the drupes.....*B. bahiana*
- Petiole ca. 7 mm; connectives visibly surpassing the anther sacs (ca. 0.7 mm length); sepals not
 accrescent on the drupes.....*B. niedenzuiana*
7. Bracts reflexed.....8
- Bracts non-reflexed.....9
8. Petals yellow becoming red to orange in age; bracts and bracteoles reflexed,; sepals accrescent
 on the fruits (1.5–2 mm on the flower); drupes sericeous at the
 apex.....*B. crispa*
- Petals white becoming pink in age; bracts reflexed and bracteoles non-reflexed; sepals not
 accrescent on the fruits; drupes glabrous.....*B. alvimii*
9. Thyrses 1-2 flowered cincinnus; drupes larger than 12 mm diam.....*B. cacaophila*
- Thyrses 1-flowered cincinnus; drupes less than 12 mm diam.....10
10. Shrubs ca. 1 m tall; petals yellow turning orange to red in age.....*B. intermedia*
- Small trees or trees higher than 1 m tall; petals white to pink.....11
11. Leaves widely elliptical to ovate; apex rounded; petiole absent (sessile) or up to 1.5 mm
 long.....*B. coccolobifolia*
- Leaves elliptical, oblong, to obovate; petiole longer than 4 mm long.....12
12. Leaves oblong; drupes up to 8 mm diam.....*B. nitidifolia*
- Leaves elliptical to obovate; drupes ca. 12 mm diam.....*B. japurensis*
13. Drupes less than 7 mm diam; abaxial side of leaves densely sericeous to sericeous (hairs

- appressed).....*B. sericea*
- Drupes larger than 7 mm; abaxial side of leaves tomentose or velutine (hairs stalked) or few trichomes appressed (slightly sericeous).....14
14. All petals white becoming pink in age; ovary glabrous.....*B. vernicosa*
- All petals yellow becoming orange in age; ovary sericeous.....15
15. Stipules 5-25 mm long, amplexicaul, deciduous; foliar lamina bearing stellate-stalked hairs.....*B. stipulacea*
- Stipules up to 6,5 mm long, not amplexicaul, persistent; foliar lamina bearing shortly-stalked T-shaped hairs.16
16. Stipules narrowly triangular to ovate; style 2.6–4.1 mm long.....*B. crassifolia*
- Stipules broadly ovate; style 4–4.8 mm long.....*B. fanshawei*

1. *Byrsonima alvimii* W.R.Anderson (1982: 11). Figure 1A.

Trees, 5–22 m tall. *Stipules* 2–9.8 × 0.8–5.6 mm, ovate, lanceolate to triangular. *Leaf blades* 3.75–23.7 × 1–9.8 cm, obovate to elliptic, base attenuate to cuneate, margins flat to slightly revolute, apex acute, acuminate, rounded, apiculate, retuse to mucronulated, both side glabrous to glabrescent, with few trichomas on midrib, midrib prominulous on abaxial side, impress to prominulous on adaxial side, principal laterals veins impress on both side and number of ca. 8; petiole 9–18 × 1.3–2.5 mm, glabrous, glabrescent to slightly sericeous. *Thyrse* of 1-flowered cincinnus, 11–38 flowers, main axis 2.3–13.8 cm long, sericeous; bract 1.4–7.2 × 1–2.5 mm, lanceolate, ovate to triangular, both side glabrous, glabrescent to sericeous, reflexed; peduncle 0–5.6 × 0.6–1 mm; bracteoles 0.8–4.3 × 0.6–2.5 mm, lanceolate,

ovate to triangular, non-reflexed, pedicels $3.5\text{--}21.4 \times 0.7\text{--}2$ mm, sericeous to tomentose; sepals $2.1\text{--}7.6 \times 1.5\text{--}4.4$ mm, abaxial side tomentose to sericeous, adaxial side glabrous, glabrescent to sericeous, margin slightly revolute at anthesis, triangular, ovate to widely ovate, not accrescent on the drupes; glands $1.3\text{--}5.3 \times 0.8\text{--}2.7$ mm; all petals white becoming pink in age, lateral petals blade ca. 4.6×6.7 mm, claw ca. 3.3×0.7 mm, margin slightly erose to entire; posterior petal blade ca. 2.7×4.2 mm, claw ca. 2.7×0.7 mm, margin erose. *Stamens* free at base, homomorphic, anthers sericeous, connectives $1.6\text{--}2.3 \times 0.3\text{--}0.8$ mm, slightly surpassing the anther sacs (up to 0.4 mm length); filaments ca. 2.3×0.6 mm, sericeous at base. *Ovary* sericeous, style ca. 2.4×0.2 mm. *Drupes* $6.6\text{--}13.4 \times 3.8\text{--}13.2$ mm, glabrous, verrucous, globose.

Specimens examined:—BRAZIL. Espírito Santo. Guarapari: Parque Estadual de Setiba, 6 June 1991, fr., *L.V. Rosa 111* (VIES!); Parque Estadual Paulo César Vinha, 2 July 1999, fr., *A.M. Assis 710* (VIES!); *L.C. Fabris 739* (VIES!); *ibidem*, 25 November 1999, bud, fl., *A.M. Assis 755* (VIES!); Parque Estadual Paulo César Vinha, 4 May 2009, fr., *G.E. Valente 2597* (VIC); Setiba, 18 March 1991, fr., *J.M.L. Gomes 1463* (VIES!); Setiba, 28 November 1990, fl., *O.J. Pereira 2285* (VIES!). Santa Teresa: Aparecidinha, Terreno de Luis Bringhenti, 750 m, 6 October 1998, fl., *L. Kollmann 666* (MBM, MBML!); *ibidem*, 9 November 1998, fl., *L. Kollmann 905* (MBML!); *ibidem*, 29 March 1999, fr., *L. Kollmann 2279* (MBML!); Estação Biológica Santa Lúcia, 650-800 m, 27 July 1993, st., *L.D. Thomaz 982* (MBML!, VIES!); Nova Lombardia, Reserva Biológica Augusto Ruschi, 870 m, 21 January 2003, fr., *R.R. Vervloet 1682* (MBML!); Santo Antônio, Terreno do Boza, 750 m, 7 October 1998, fl., *L. Kollmann 708* (MBM, MBML!); *ibidem*, 29 October 1998, fl., *L. Kollmann 876* (MBML!); *ibidem*, 800 m, 8 December 1998, fr., *L. Kollmann 1256* (MBML!); Santo Henrique, beira de estrada, 26 January 2005, fr., *L. Kollmann 7327* (MBML!); Vila Velha: Reserva Ecológica de Jacarenema, 28 June 2000, fr., *O.J. Pereira 6229* (VIES!).

Notes:—*Byrsonima alvimii* is endemic to Brazil, occurring only in the states of Bahia and Espírito Santo in the domain of the Atlantic Forest (Francener 2020). According to the National Flora Conservation Center (CNCFlora 2021), the species is categorized as vulnerable. It is characterized by only bracts reflexed (bracteoles are non-reflexed), deciduous in the maturity, drupes verrucous, leaves glabrous to glabrescent on both sides, with few trichomes on midrib, and margin entire. It resembles *B. cacaophila*, but this last one has a thyse of 1-2 flowered cincinnus, bracts, and bracteoles smaller (up to 2.4 mm long) and its drupes are smooth.

2. *Byrsonima bahiana* W.R.Anderson (1982: 110). Figure 1B.

Trees, ca. 10 m tall. *Stipules* ca. 2.2×1.2 mm, triangular. *Leaf blades* ca. 7×4.5 cm, obovate to widely elliptic, base cuneate, margins flat, apex rounded to retuse, both sides glabrous, midrib prominulous on abaxial side, impress on adaxial side, principal laterals veins ca. 10, impress on both sides; petioles ca. 13.6×2.3 mm, glabrous. *Thyrse* of 1-flowered cincinnus with ca. 25 flowers, main axis ca. 9.2 cm long, glabrescent; bracts ca. 1.7×0.7 mm, triangular, abaxial side glabrous, adaxial side glabrescent, non-reflexed; peduncle absent; bracteoles ca. 1.2×1 mm, ovate, non-reflexed; pedicels ca. 8.5×1.2 mm, glabrous. *Flowers* not seen [according to Anderson (1981) the sepals ca. 2.5×3 mm, both sides glabrous except for tiny hairs on the margin, margin revolute at anthesis, rounded, accrescent on the drupes; glands ca. 2.5–3 mm long; all petals white, often tinged with pink, with reddish claw. *Anthers* glabrous; connectives slightly surpassing the anther sacs (up to 0.1 mm in length); filaments 2–3 mm long, sericeous at base; *Ovary* glabrous]. *Drupes* ca. 10×8.8 mm, glabrous, verrucous, globose.

Specimen examined:—BRAZIL. Espírito Santo. Conceição da Barra: Itaúnas, Parque Estadual de Itaúnas, Fazenda Jequitaia, 1 May 2010, fr., A.G. Oliveira 792 (VIES!).

Notes:—*Byrsonima bahiana* is endemic of Brazil. Occurs in the states of Bahia, Espírito Santo, Sergipe and Alagoas, in the domain of the Atlantic Forest (Francener 2020). According to the National Flora Conservation Center (CNCFlora 2021), is categorized as near threatened. *Byrsonima bahiana* has accrescent fleshy sepals on the drupes, the reddish color on the leaves margins and the midrib, and bracts and bracteoles deciduous after anthesis. In addition, the sepals on both sides are glabrous except for tiny hairs on the margin. It resembles *B. alvimii*, but the last has reflexed bracts, abaxial side of the sepals tomentose to sericeous and sepals not accrescent on the drupes.

3. *Byrsonima cacaophila* W.R.Anderson (1982: 98). Figure 2A.

Trees, 7–26 m tall. *Stipules* 1.5–3.2 × 1–2.3 mm, triangular to narrowly triangular. *Leaf blades* 7.8–15.6 × 3.7–7.6 cm, obovate to elliptic, base attenuate to cuneate, margins flat to slightly revolute, apex acute, acuminate to rounded, abaxial side glabrous, glabrescent, with few trichomas on midrib, adaxial side glabrous, midrib prominulous on both side, principal laterals veins impress on both side and number of ca. 9; petiole 8.2–18.5 × 0.9–3 mm, glabrous, glabrescent to slightly sericeous. *Thyrse* of 1-2 flowered cincinnus, 35–60 flowers, main axis 5.27–9.1 cm long, tomentose to densely tomentose; bracts 0.9–2.4 × 0.6–1.4 mm, lanceolate to triangular, abaxial side sericeous to tomentose, adaxial side glabrous to glabrescent, non-reflexed; peduncle 2.3–4.4 × 0.5–1.2 mm; bracteoles 1–1.4 × 0.6–1.2 mm, triangular, non-reflexed; pedicels 3.7–7.7 × 0.5–1.3 mm, densely tomentose to tomentose; sepals 1.9–3 × 1.6–2.4 mm, abaxial side tomentose to sericeous, adaxial side glabrous to

glabrescent, margin flat at anthesis, triangular to ovate, not accrescent on the drupes; glands $1.4\text{--}2.5 \times 0.4\text{--}1.5$ mm; all petals white becoming pink in age, lateral petals blade $3.6\text{--}7.5 \times 4\text{--}5.5$ mm, claw $1.7\text{--}2.7 \times 0.4\text{--}0.7$ mm, margin slightly erose to erose; posterior petal blade $2.6\text{--}3.5 \times 1.6\text{--}3.2$ mm, claw $2.2\text{--}3.2 \times 0.7\text{--}0.9$ mm, margin erose. *Stamens* free at base, homomorphic, anthers sericeous, connectives $1.5\text{--}2.8 \times 0.4\text{--}0.9$ mm, surpassing the anther sacs (0.1–0.5 mm length); filaments $0.8\text{--}2 \times 0.3\text{--}0.5$ mm, sericeous at base. *Ovary* sericeous, style $2.3\text{--}3 \times 0.3\text{--}0.4$ mm. *Drupes* $10\text{--}18 \times 12\text{--}14$ mm, glabrous, glabrescent to slightly sericeous, smooth, globose.

Specimens examined:—BRAZIL. Espírito Santo. Linhares: ES 440 Linhares a Regência, 20 January 2014, bud, fl., *D.A. Folli 7175* (CVRD!, RB!); Reserva Natural da Vale, 02 February 1978. bud, fl., *J. Spada 38/78* (CVRD!, HUFSJ!); *ibidem*, 18 May 1995, fr., *D.A. Folli 2615* (CVRD!, HUFSJ!); *ibidem*, 13 January 2010, bud, fl., *G.S. Siqueira 517* (CVRD!, HUFSJ!); *ibidem*, 24 January 2005, bud, fl., *D.A. Folli 5019* (CVRD!, HUFSJ!); *ibidem*, 18 April 2013, fr., *G.S. Siqueira 882* (CVRD!, HUFSJ!); Reserva Natural da Vale, estrada Jacarandá-Caveuna, 41 m, 16 April 2011, fr., *J.C. Lopes 174* (RB!). Marilândia: Liberdade, prop: Reinaldo Bautz, $19^{\circ}19'57''$ S, $40^{\circ}32'5''$ W, 400-500 m, 27 September 2006, fr., *L.F.S. Magnago 1432* (MBML!).

Notes:—*Byrsonima cacaophila* is endemic of Brazil. It occurs only in the states of Bahia and Espírito Santo in the domain of the Atlantic Forest (Francener 2020). According to the National Flora Conservation Center (CNCFlora 2021), *B. cacaophila* is considered near threatened. It is characterized by the presence of a large peduncle (ca. 3 mm long), thyse 1-2 flowered cincinnus, large petiole (ca. 10 mm long), bracts not-reflexed, drupes ca. 14 mm long. The exsiccate examined with flowers had a sericeous ovary, but they are at variance with the original description (Anderson 1982). *B. cacaophila* resembles *B. perseifolia* and *B. alvimii* as mentioned above.

4. *Byrsonima coccolobifolia* Kunth (1822: 148). Figure 2B.

Small trees, 1–2 m tall. *Stipules* ca. 2.6×1.2 mm, triangular. *Leaf blades* ca. 6.6×4.2 cm, widely elliptic to ovate, base subcordate to cuneate, margins flat, apex rounded, both sides glabrous, midrib prominulous on both sides and principal laterals veins impress on both sides and number of ca. 6; petiole $0\text{--}1.5 \times 0\text{--}2.3$ mm, glabrous. *Thyrse* of 1-flowered cincinnus, main axis ca. 6.5 cm long, densely tomentose; bract ca. 2×0.7 mm, lanceolate, abaxial side slightly sericeous, adaxial side glabrous to glabrescent, non-reflexed; peduncle absent; bracteoles ca. 1.5×0.8 mm, triangular, non-reflexed; pedicels ca. 2.5×0.7 mm, sericeous; sepals ca. 2.4×1.5 mm, both sides sericeous, margin slightly revolute at anthesis, ovate, not accrescent on the drupes; glands ca. 1.2×0.7 mm. all petals white to pink becoming pink in age; lateral petals blade ca. 4.5×4 mm, claw ca. 2.7×0.5 mm, margins entire; posterior petal blade ca. 2.5×4.6 mm, claw ca. 4.3×0.6 mm, margins entire. *Stamens* free at base, homomorphic; anthers sericeous; connectives ca. 1.8×0.8 mm, not surpassing the anther sacs; filaments ca. 2.6×0.7 mm, densely sericeous at base. *Ovary* glabrescent; styles ca. 4.8×0.3 mm. *Drupes* not seen [according to Anderson (1981), 7–8 mm diam, glabrous, globose or ovoid].

Specimens examined:—BRAZIL. Espírito Santo. Conceição da Barra: Área 157 da Aracruz Celulose S.A., 26 March 1992, fl., *O.J. Pereira 3200* (VIES!); Parque Estadual de Itaúnas, 26 April 2000, bud., *O.J. Pereira 6157* (VIES!).

Additional specimens examined: BRAZIL. Minas Gerais, São João del-Rei: loteamento Pinheiros, distrito do Rio das Mortes, $21^{\circ}19'89''$ S, $44^{\circ}34'42''$ W, 26 November 2017, bud., fl., *L.L. Alves 227* (HUFSJ).

Notes:—*Byrsonima coccolobifolia* occurs from Cuba descending from South America to Paraguay, passing through Colombia, Peru, Venezuela, and Brazil. In Brazil is widely

distributed in all regions, in the domain of the Atlantic Forest, Amazonia, and Cerrado (Francener 2020). It is characterized by its leaves widely elliptic to ovate, base subcordate to cuneate, margins flat, apex rounded, usually midrib, and principal laterals veins pink, petiole absent or small (ca. 1.5 mm), bracts not reflexed. This species does not resemble any other of the 16 species in the study area.

5. *Byrsonima crassifolia* (Linnaeus 1753: 426) Kunth (1822: 149). Figure 2C.

Trees, 3–25 m tall. *Stipules* 2.8–6.4 × 2–4.5 mm, triangular, narrowly triangular to ovate, not amplexicaul, persistent. *Leaf blades* 7.9–16 × 3.7–7.4 cm, obovate, ovate to elliptic, base attenuate to cuneate, margins flat to slightly revolute, apex acute, acuminate, rounded to apiculate, abaxial side of the leaves tomentose when young but deciduous with maturity, adaxial side glabrous, glabrescent to tomentose on midrib, but deciduous with maturity, shortly-stalked T-shaped hairs, midrib prominulous on abaxial side, impress on adaxial side, principal laterals veins prominulous on abaxial side, impress on adaxial side and number of ca. 8; petiole 9–14 × 1.5–2.5 mm, glabrescent to sericeous. *Thyrse* of 1-2-flowered cincinnus, 35–60 flowers, main axis 6.5–15.2 cm long, glabrescent, tomentose to sericeous; bract 1.7–3.7 × 1–1.4 mm, triangular, abaxial side sericeous, adaxial side glabrous to glabrescent, non-reflexed; peduncle 0–2.2 × 0–1.6 mm; bracteoles 1.4–2.1 × 0.6–0.9 mm, triangular, non-reflexed, pedicels 6.6–11.8 × 0.4–1.6 mm, glabrescent, tomentose to sericeous; sepals 1.6–5.4 × 1.4–4.6 mm, abaxial side glabrous, sericeous to tomentose, adaxial side glabrous, glabrescent to sericeous, margin flat to slightly revolute at anthesis, triangular to ovate, not accrescent on the drupes; glands 2.1–3.7 × 0.9–1.3 mm; all petals yellow becoming red to orange in age, lateral petals blade 3.9–5.5 × 3.6–5.4 mm, claw 2.1–3.2 × 0.2–0.5 mm, margin flat to slightly erose; posterior petal blade 2.3–3.3 × 2.4–2.9 mm, claw 2.9–3.8 × 0.7–1 mm, margin erose. *Stamens* free at base, homomorphic, anthers sericeous, connectives 2–2.4 ×

0.5–0.9 mm, surpassing the anther sacs (0.4–0.5 mm length); filaments 2–2.3 × 0.4–0.6 mm, sericeous at base. *Ovary* sericeous, style 2.6–4.1 × 0.2–0.3 mm. *Drupes* 11.5–20 × 10–17.6 mm, glabrous to glabrescent, smooth, globose to ovoid.

Specimens examined:—BRAZIL. Espírito Santo. Linhares: Área Experimental da Reserva Natural Vale, 20 April 2006, fr., *G.S. Siqueira 250* (CVRD!, HUFSJ!); *ibidem*, 29 September 2006, bud, fl., *D.A. Folli 5361* (CVRD!, HUFSJ!); Reserva Natural Vale, 08 January 1973, bud, fl., *J. Spada 138/73* (CVRD!); *ibidem*, 05 January 1978, bud, fl., *J. Spada 17/78* (CVRD!); *ibidem*, 24 July 1991, fr., *G.L. Farias 461* (CVRD!, HUFSJ!); *ibidem*, 17 July 2002, fr., *D.A. Folli 4289* (CVRD!); *ibidem*, 8 April 2005, fr., *D.A. Folli 5045* (CVRD!, HUFSJ!). Serra: Morro do Mestre Álvaro, 22 March 2010, fr., *D.A. Folli 6593* (CVRD!, HUFSJ!); Reserva Florestal, próximo a estrada X-I talhão 301, 25 January 1973, bud, fl., *J. Spada 162* (CVRD!, RB!).

Notes:—*Byrsonima crassifolia* is a widespread species, from Mexico and West Indies to South America, reaching Bolivia and Brazil (Francener 2020). Occurs in almost all Brazilian states, except the southern states and Rio de Janeiro, Acre, Alagoas, and Sergipe. *Byrsonima crassifolia* is characterized by yellow petals turning red or orange in age, thyse 1-2-flowered, the main axis ca. 10 cm long, glabrescent, tomentose to sericeous (hairs stalked), ovary and anther sericeous and drupes ca. 16 mm diam. *Byrsonima crassifolia* resembles *B. alvimii*, but it should be noted that the latter has glabrous leaves with few trichomes in the central vein, while *B. crassifolia* has tomentose leaves when young, deciduous with maturity, and when in flowers the colors the petals are different between these two species.

6. *Byrsonima crista* A.Jussieu (1840: 335). Figure 2D.

Trees, 5–19 m tall. *Stipules* 2–4 × 0.8–1.8 mm, triangular. *Leaf blades* 12.2–17.2 × 5.5–6.4 cm, ovate to elliptic, base attenuate to cuneate, margins flat, apex acute to acuminate, abaxial side glabrous to glabrescent, with few trichomas on midrib, adaxial side glabrous, midrib and principal lateral veins prominent and number of ca. 11; petiole 24–34 × 1.4–2.4 mm, glabrous, glabrescent to slightly sericeous. *Thyrse* of 1-flowered cincinnus, ca. 55 flowers, main axis 4.2–10 cm long, tomentose to sericeous; bract 3–4.6 × 0.4–1 mm, lanceolate to triangular, both side tomentose to sericeous, reflexed; peduncle 0–1.4 × 0.4 mm; bracteoles 1.4–1.6 × 0.9–1.4 mm, triangular, reflexed; pedicels 11–33 × 0.5–1.8 mm, tomentose to slightly sericeous; sepals 4–5.6 × 2.8 mm, both side sericeous to glabrescent, margin slightly revolute at anthesis, triangular, accrescent on the drupes; glands 2.2–2.9 × 0.9–1.1 mm; petals yellow becoming red to orange in age, lateral petals blade ca. 5.3 × 4.9 mm, claw ca. 2.9 × 0.5 mm, margin slightly erose; posterior petal blade ca. 3.1 × 3.2 mm, claw ca. 3.1 × 0.9 mm, margin slightly erose. *Stamens* free, homomorphic, anthers sericeous, connectives ca. 1.9 × 0.9 mm, not surpassing the anther sacs; filaments ca. 2 × 0.3 mm, sericeous at base. *Ovary* sericeous, style ca. 4 × 0.3 mm. *Drupes* 6.4–8.4 × 5.3–8 mm, sericeous on the apex, smooth, globose to ovoid.

Specimens examined:—BRAZIL. Espírito Santo. Águia Branca: Santa Luzia, prop. Ciro Ferreira, 18°59'5.4" S, 40°39'44.9" W, 150–270 m, 20 December 2007, bud, fl., *V. Demuner 4843* (MBML!). Colatina: 30 January 1992, bud, fl., *V.D. Souza 306* (CVRD!, HUFSJ!). Conceição da Barra: Reserva Biológica de Córrego Grande, km 3 a 4 da estrada interna, 13 July 2011, fr., *M. Ribeiro 570* (VIES!). Marilândia: Estrada ES 356, 8 February 2012, fr., *D.A. Folli 6845* (CVRD!, HUFSJ!).

Notes:—*Byrsonima crispera* is a widespread species, from south of Central America and north of South America on Amazon Forest, with disjunct distribution on Atlantic Forest (Francener 2020). It is characterized by leaves elliptic, margin undulate, with acuminate apex, midrib and lateral veins prominulous, bracts and bracteoles strongly reflexed and usually persistent to maturity of the fruit, long petiole and sepals accrescent in fruit (Anderson 1981). Although bracts and bracteoles are usually persistent at maturity, one of the examined exsiccate did not preserve this characteristic (*Folli 6845*, HUFSJ). *B. crispera* resembles *B. sericea*, but the latter has a densely sericeous abaxial side and appressed bracts and bracteoles.

7. *Byrsonima fanshawei* W.R.Anderson (1981: 84). Figure 1C.

Trees, ca. 12 m tall. *Stipules* ca. 6.2×2.5 mm, broadly ovate, not amplexicaul, persistent. *Leaf blades* ca. 13.7×6 cm, elliptic, base cuneate to attenuate, margins flat to slightly revolute, apex acute, cuspidate to acuminate, abaxial side tomentose to slightly sericeous, adaxial side glabrous to glabrescent, shortly-stalked T-shaped hairs, midrib prominulous on side abaxial and impress on side adaxial, principal laterals veins prominulous on side abaxial and impress on side adaxial and number of ca. 11; petiole ca. 16×1.5 mm, tomentose, sericeous to glabrescent. *Thyrse* of 1-flowered cincinnus, ca. 60 flowers, main axis ca. 13.6 cm long, tomentose; bract ca. 2×1.4 mm, triangular, abaxial side sericeous, adaxial side glabrescent, non-reflexed; peduncle ca. 2.7×1.2 mm; bracteoles ca. 1.4×1.1 mm, triangular, non-reflexed; pedicels ca. 11.2×1 mm, tomentose; sepals ca. 4.8×3.0 mm, sericeous to glabrescent on both sides, margin flat to slightly revolute at anthesis, triangular, not accrescent on the drupes; glands ca. 2.5×1 mm. *Flowers* not seen [according to Francener *et al.* (2018), all petals yellow becoming red to orange in age, lateral petals blade $5.5\text{--}5.2 \times 5\text{--}5.2$ mm, claw $2.3\text{--}3 \times 0.8\text{--}0.9$ mm, margin slightly erose; posterior petal blade $3.8\text{--}4 \times 3.5\text{--}4$ mm, claw $3\text{--}3.5 \times 0.9$ mm, margin slightly erose. *Stamens* free, homomorphic, anthers

sericeous, connectives $2\text{--}2.7 \times 0.6\text{--}1$ mm, surpassing or not the anther sacs (0–0.4 mm length); filaments $2\text{--}2.3 \times 0.7\text{--}1$ mm, sericeous at base. *Ovary* sericeous, style 4–4.8 mm long]. *Drapes* ca. 9.5×8.5 mm, sericeous to glabrescent, smooth, globose.

Specimens examined:—BRAZIL. Espírito Santo. Conceição da Barra: Reserva Biológica do Córrego Grande, 14 May 2017, fr., *D.A. Folli 7555* (CVRD!, HUFSJ!). Linhares: Reserva Natural Vale, 19 June 2006, fr., *D.A. Folli 5303* (CVRD!, HUFSJ!).

Notes:—*Byrsonima fanshawei* occurs in Guyana and Brazil, in the states of Espírito Santo, Bahia, and Amazonas, in the domain of the Atlantic Forest and Amazon Forest (Francener *et al.* 2018). It resembles *B. stipulacea*, but the latter has longer and deciduous stipules (amplexicaul), stellate leaf-hairs, and is larger, while *B. fanshawei* is shorter, persistent stipules (sometimes deciduous), shortly-stalked T-shaped leaf-hairs, and by small fruits (Anderson 1981).

8. *Byrsonima intermedia* A.Jussieu (1833: 82). Figure 2E.

Shrubs, ca. 1 m tall. *Stipules* ca. 3.8×2.2 mm, widely triangular. *Leaf blades* ca. 5.2×2.9 cm, elliptic to lanceolate, base attenuate, margins flat, apex rounded to acute, abaxial side glabrous to glabrescent, with a few sericeous hairs in midrib, adaxial side glabrous, midrib and principal laterals veins prominulous at both sides and number of ca. 8; petiole ca. 3.3×3.1 mm, glabrescent. *Thyrse* of 1-flowered cincinnus, ca. 25 flowers, main axis ca. 5.8 cm long, tomentose; bract ca. 1×0.7 mm, ovate, abaxial side sericeous, adaxial side slightly sericeous, non-reflexed; peduncle absent; bracteoles ca. 1×0.6 mm, ovate, non-reflexed; pedicels ca. 3.5×1 mm, sericeous; sepals ca. 2.2×1.7 mm, both the sides sericeous, margin slightly revolute at anthesis, widely ovate, not accrescent on the drupes; glands ca. 2.4×1.4

mm; all petals yellow becoming red to orange in age, lateral petals blade ca. 4.7×5.3 mm, claw ca. 2.2×0.6 mm, margin entire to slightly erose; posterior petal blade ca. 2×3.7 mm, claw ca. 2.4×0.8 mm, margin erose. *Stamens* free, homomorphic, anthers sericeous, with few trichomes, connectives ca. 1.8×0.8 mm, equaling pollen sacs; filaments ca. 1.7×0.7 mm, sericeous at base. *Ovary* glabrous, style ca. 2.6×0.4 mm. *Drupes* ca. 4×5 mm, glabrous, smooth, ovoid.

Specimen examined:—BRAZIL. Espírito Santo. Santa Teresa: Pedra da Paulista, 17 February 2000, bud, fl., fr., V. Demuner 741 (MBML!).

Notes:—*Byrsonima intermedia* occurs in Paraguay and Brazil, in the states of Pará, Tocantins, Bahia, Distrito Federal, Goiás, Mato Grosso do Sul, Mato Grosso, Minas Gerais, São Paulo and Paraná, in the domain of the Atlantic Forest, Amazonia, Cerrado and Pantanal (Francener 2020). It is characterized by size – shrubs, ca. 1 m tall, leaves elliptic to lanceolate, base attenuate, apex rounded to acute, abaxial side slightly sericeous in the midrib, adaxial side glabrous, bracts not reflexed, yellow petals becoming orange or red in age. It resembles *B. crassifolia* but it has the abaxial side of the leaves tomentose when young, connective surpassing the anther sacs (0.4–0.5 mm length) and ovary sericeous. *B. intermedia* is recorded for the first time for the Espírito Santo state.

9. *Byrsonima japurensis* A.Jussieu (1840: 335). Figure 1D.

Trees, 3–20 m tall. *Stipules* ca. 2.1×0.6 mm, triangular. *Leaf blades* ca. 7.9×5.15 cm, elliptic to obovate, base attenuate, margins flat to slightly revolute, apex acuminate to rounded, both side glabrous, midrib prominulous on side abaxial and impress on side adaxial, principal laterals veins prominulous on side abaxial and impress on side adaxial, and number of ca. 8; petiole ca. 8.6×1.75 mm, densely tomentose. *Thyrse* 1-flowered cincinnus, ca. 15

flowers, main axis ca. 7.5 cm long, densely tomentose; *bracts* not seen [according to Rolim (2004), 0.5–1.5 × 0.5–1 mm, lanceolate, ovate, triangular to rarely suborbicular, abaxial side slightly sericeous to slightly tomentose, adaxial side glabrous, non-reflexed]; peduncle ca. 0.8 × 1.5 mm, densely tomentose; *bracteoles* not seen [according to Rolim (2004), 0.5–1 × 0.5–0.8 mm, lanceolate, triangular, ovate, oblong to rarely suborbicular, non-reflexed]; pedicels ca. 13.8 × 1.2 mm, densely tomentose; sepals ca. 2.8 × 2.9 mm, abaxial side glabrous, sericeous to tomentose, adaxial side glabrous to slightly sericeous, margin flat to slightly revolute at anthesis, triangular, not accrescent on the drupes; glands ca. 1.8 × 1 mm. *Flowers* not seen [according to Rolim (2004), all petals white becoming pink in age, lateral petals blade 3–4.45 × 4–6 mm, claw ca. 3 × 0.6 mm, margin erose; posterior petal blade ca. 3–4 × 3–3.5 mm, claw ca. 3 × 0.9 mm, margin erose. *Stamens* free, homomorphic, anthers sericeous, connectives 0.7–3.2 × 0.5 mm, surpassing the anther sacs (0.2–1.7 mm length); filaments 1.8–2 × 0.3–0.7 mm, sericeous at base. *Ovary* glabrous, style 3.4–4.6 mm long]. *Drupes* ca. 11.3 × 12 mm, glabrous, verrucous, globose.

Specimens examined:—BRAZIL. Espírito Santo. Santa Teresa: Estação Biológica Santa Lúcia, trilha do palmitreiro, 30 September 1999, fr., V. Demuner 59 (MBML!); Reserva Biológica de Nova Lombardia, December 1989, st. L.P.S. Pinto s.n. (BHCB!, MBML!).

Notes:—*Byrsonima japurensis* occurs in Brazil, Colombia, Ecuador, Peru, and Venezuela. The Brazilian territory has a wide distribution of these species: in the north, northeast, and southeast regions, in the domain of the Atlantic Forest and Amazonia (Francener 2020). Leaves obovate to elliptical, petiole ca. 8.5 mm long, densely tomentose, the main axis ca. 7.5 mm long, densely tomentose, bracts non-reflexed and deciduous at maturity, characterize *B. japurensis*. It resembles *B. perseifolia* but it has a larger petiole (ca. 12 mm long), glabrescent to slightly sericeous, the main axis ca. 6 mm long, slightly sericeous, and smaller drupes (ca. 8.5 mm).

10. *Byrsonima ligustrifolia* A.Jussieu (1833: 82). Figure 3A.

Trees, ca. 10 m tall. *Stipules* ca. 1.5×1.4 mm, ovate. *Leaf blades* ca. 9.8×3.8 cm, narrowly elliptic to lanceolate, base attenuate, margins flat, apex acuminate, both sides glabrescent, sericeous on midrib, midrib prominulous on both sides, principal laterals veins ca. 13, impress on both sides; petioles ca. 12×1 mm, glabrescent to sericeous. *Thyrse* of 1–2-flowered cincinnus, with ca. 50 flowers, the main axis ca. 5.6 cm long, sericeous; bracts ca. 12×0.7 mm, triangular, sericeous on both sides, non-reflexed; peduncles ca. 3.3×0.9 mm; *bracteoles* not seen, [according to Rolim (2004), $2\text{--}2.5 \times 0.5\text{--}1.5$ mm, lanceolate, ovate to triangular, non-reflexed]; pedicels ca. 0.7–7.6 mm, sericeous. *Flowers* not seen [according to Rolim (2004), sepals ca. 2.5×1.7 mm, both side glabrous, sericeous to tomentose, triangular to ovate, not accrescent on the drupes; glands $2.1\text{--}3.7 \times 0.9\text{--}1.3$ mm; lateral petals white to pink becoming red in age, blade ca. 3.7×4.7 mm, claw ca. 1.8×0.6 mm, margin subentire to slightly erose; posterior petal white to pink becoming red in age with the claw yellow, blade ca. $3.5\text{--}4 \times 3.5\text{--}5$ mm, claw ca. $2.1 \times 0.8\text{--}1.1$ mm, margin subentire to erose. *Stamens* free at base, homomorphic, anthers glabrous, connectives $2.1\text{--}2.5 \times 0.8$ mm, surpassing the anther sacs (0.1–1 mm in length); filaments $2.5\text{--}2.9 \times 0.5\text{--}0.7$ mm, sericeous at base. *Ovary* glabrous, styles 2.1–4.1 mm long]. *Drupes* ca. 12.2×11.4 mm, glabrescent to sericeous, verrucous, globose.

Specimen examined:—BRAZIL. Espírito Santo. Linhares: 27 February 2015, fr., D.A. *Folli* 7347 (CVRD!, HUFSJ!); Marilândia, Alto Liberdade, $19^{\circ}21'13''$ S, $40^{\circ}31'1''$ W, 19 April 2006, fl., L.F.S. *Magnago* 942 (SP, MBML); Venda Nova, Conceição do Castelo, 20 August 1987, fr., G.M. *Hatschbach* 51336 (INPA, CEPEC, MO, FLOR, UPCB, US, SP, MBM).

Notes:—*Byrsonima ligustrifolia* is endemic to Brazil, it is distributed from the state of Bahia to southern Brazil within the Atlantic Forest domain (Francener 2020). Its main features are

the lanceolate leaves with acuminate apex and flowers with laterals petals white to pink and posterior petal white to pink becoming red in age with the claw yellow (Rolim 2004), ovary glabrous and anthers and inflorescence axis tomentose.

11. *Byrsonima myricifolia* Grisebach (1875: 125). Figure 4A.

Trees, 5–14 m tall. *Stipules* 1.4–2.3 × 0.5–0.9 mm, triangular to lanceolate. *Leaf blades* 2.26–5.34 × 0.8–2.58 cm, obovate, oblong to elliptic, base attenuate, margins revolute, apex acute, acuminate to rounded, abaxial side glabrous to glabrescent, adaxial side glabrous, midrib prominulous on both sides, lateral veins up to 5, impress on both sides; petioles 5–11 × 11–16 mm, glabrescent to slightly tomentose. *Thyrse*, bearing ca. 20 flowers, of 1-flowered per cincinnus, main axis 2.9–3.2 cm long, glabrous; bracts ca. 1.8 × 0.7 mm, lanceolate, glabrescent on both sides, non-reflexed; peduncle 0–0.6 mm long; bracteoles ca. 1 × 0.3 mm, lanceolate, non-reflexed; pedicels 7.8–11 × 0.8–1.3 mm, sericeous; sepals 2–3.5 × 1.5–2.5 mm, abaxially glabrous or slightly sericeous to slightly tomentose, adaxially glabrescent, margin flat at anthesis, triangular to widely ovate, not accrescent on the drupes; glands 1.1–2.3 × 0.5–1 mm; all petals white to pink becoming red with age, lateral petals with blades 3.5–5 × 4.7–6 mm, claw 2.6–2.9 × 0.6–0.8 mm, margin slightly entire to erose; posterior petal blade 2.8–4.6 × 2.8–5 mm, claw ca. 3 × 0.5–0.8 mm, margin slightly entire to erose. *Stamens* free at base, homomorphic, anthers glabrous to glabrescent, connectives ca. 2 × 0.8 mm, surpassing the anther sacs (0–1 mm length); filaments ca. 2.3 × 0.4 mm, sericeous at base. *Ovary* glabrous to sericeous, styles ca. 2.3 × 0.4 mm. *Drupes* not seen [according to Grisebach (1875) they are globose to ovoid, up to 4 mm].

Specimens examined:—BRAZIL. Espírito Santo. Santa Teresa: Cabeceira do Rio Bonito, terreno da Aeronáutica, radar, 1030 m, 12 June 2001, bud, *L. Kollmann 3901* (MBML!); Estação Biológica Santa Lúcia, 16 October 2004, fl., *F.A.G. Guilherme 391* (MBML!); Santo Antônio, terreno do Boza, 750 m, 9 February 1999, fl., *L. Kollmann 1867* (MBML!).

Notes:—*Byrsonima myricifolia* is endemic to Brazil. It is distributed from the states of Bahia to Paraná within the Atlantic Forest domain (Francener 2020). Its main features are the short main axis (ca. 3 cm), with few flowers and small glabrous leaves. It resembles *B. ligustrifolia*, but it has inflorescences with the main axis longer (up to 5 cm) and tomentose. Rolim (2004) considered *B. myricifolia* as a variety of *B. ligustrifolia*. In her opinion, although these plants have differences, the proximity between them is very great and possibly, they may be in a process of speciation or come from hybridizations (Rolim 2004). It is necessary to highlight the inconsistencies in the description of the material examined *Kollmann 1867* (MBML) with the original (Grisebach 1875), such as anthers and glabrous ovaries and connective exceeding the anther sacs.

12. *Byrsonima niedenzuiana* Skottsberg (1901: 36). Figure 4B.

Trees, ca. 10 m tall. *Stipules* ca. 2.9×1.2 mm, triangular. *Leaf blades* ca. 6.7×3.7 cm, obovate, base attenuate, margins flat to slightly revolute, apex rounded to retuse, both sides glabrous to glabrescent, midrib prominulous on abaxial side and impress on adaxial side, principal laterals veins ca. 8, prominulous to impress on abaxial side and impress on adaxial side; petioles ca. 7×1.6 mm, tomentose to glabrescent. *Thyrse* of 1-flowered cincinnus, with ca. 18 flowers, main axis ca. 6.6 cm long, densely tomentose ferruginous; bracts ca. 1.5×0.7 mm, lanceolate, abaxial side densely tomentose, adaxial side glabrescent, non-reflexed;

peduncle absent to 1.5×0.7 mm; bracteoles ca. 1.2×0.5 mm, triangular, non-reflexed; pedicels ca. 7.8×0.8 mm, densely tomentose; sepals ca. 3.7×2.8 mm, abaxial side tomentose to slightly sericeous, adaxial side tomentose to glabrescent, margin flat at anthesis, triangular, not accrescent on the drupes; glands ca. 2.4×1.4 mm; all petals pink, lateral petals blade ca. 5.4×4.6 mm, claw ca. 2.3×0.3 mm, margin slightly erose; posterior petal blade ca. 3.3×3.2 mm, claw ca. 2.5×0.8 mm, margin slightly erose. *Stamens* free, homomorphic, anthers glabrous, connectives ca. 1.9×0.6 mm, surpassing the anther sacs (up to 0.7 mm length); filaments ca. 2×0.4 mm, sericeous at base. *Ovary* glabrous, style ca. 2.3×0.4 mm. *Drupes* ca. 9×9.8 mm, sericeous on below side, smooth, globose.

Specimens examined:—BRAZIL. Espírito Santo. Santa Teresa: Nova Lombardia, Reserva Biológica Augusto Ruschi, estrada Goipabo-Açu, parte final, 8 April 2003, fr., *R.R. Vervloet* 2155 (MBML!); Reserva Biológica de Nova Lombardia, Picada da Cachoeira, 800-1000 m, 10 May 1985, fl., *G. Martinelli* 10947 (MBML!, RB!).

Notes:—*Byrsonima niedenzuiana* is endemic of Brazil, occurs in the states of Espírito Santo, São Paulo, Paraná, Rio Grande do Sul and Santa Catarina, in the domain of the Atlantic Forest (Francener 2020). Its main features are obovate leaves with apex rounded to retuse, all petals pink, smooth fruits, ca. 9 mm, connectives surpassing the anther sacs (up to 0.7 mm length), and sepals of the same size on drupes. It resembles *B. bahiana*, but it has the verrucous fruits, the connectives slightly surpassing the anther sacs (up to 0.1 mm length), and all petals white, often tinged with pink, with reddish claw and enlarger fleshy sepals on drupes.

13. *Byrsonima nitidifolia* A.Jussieu (1843: 296). Figure 4C.

Small trees, 2–9 m tall. Stipules 2.5–5 × 0.9–2.6 mm, triangular to lanceolate. Leaf blades 3.8–7.3 × 2–4.6 cm, oblong, base attenuate, cuneate to sessile, margins slightly revolute and undulate, apex acute, acuminate, rounded, apiculate to retuse, both side glabrous, midrib prominulous on both side, principal laterals veins prominulous on abaxial side and impress on adaxial side and number of ca. 8; petiole 4–7 × 1–1.9 mm, sericeous, slightly sericeous to tomentose. Thyse of 1-flowered cincinnus, ca. 21 flowers, main axis 3.5–8.8 cm long, tomentose; bract ca. 2.5 × 1.7 mm, ovate, both side tomentose, non-reflexed; peduncle 0–1.2 × 1 mm; bracteoles ca. 1.8 × 1 mm, ovate, non-reflexed; pedicels ca. 1.1 × 1.2 mm, densely tomentose; sepals 2.4–7.6 × 1.6–3 mm, abaxial side densely tomentose, adaxial side sericeous at base, glabrescent to slightly sericeous, margin flat to slightly revolute at anthesis, triangular, not accrescent on the drupes; glands 1.3–3.5 × 0.4–2 mm. Flowers not seen [according to Jussieu (1843), all petals white becoming pink in age. Anthers sericeous, connectives surpassing the anther sacs. Ovary glabrous]. Drupes 6.6–10 × 6–8 mm, glabrous, smooth, globose.

Specimens examined:—BRAZIL. Espírito Santo. Águia Branca: Pedra da Bandeira, Santa Luzia, prop: Ciro Ferreira, 18°58'40" S, 40°39'56" W, 170-600 m, 26 July 2006, fr., *L.F.S. Magnago 1103* (MBML!); *ibidem*, 18°58'28" S, 40°39'43" W, 250-450 m, 18 May 2007, fr., *V. Demuner 3976* (CEPEC, MBML, SP); São Pedro, pedra do CEIER, 19°01'22.2" S, 40°38'52.8" W, 200-550 m, 26 April 2006fr., *V. Demuner 2242* (MBML!, CEPEC). Nova Venécia: Área de Proteção Ambiental da Pedra do Elefante, Serra de Baixo, beira da rodovia Nova Venécia-São Gabriel da Palha, prop: Sr. Valdemar, 18°48'16" S, 40°28'11" W, 314 m, 9 May 2008, fr., *A.M.A. Amorim 7411* (MBML!); Área de Proteção Ambiental da Pedra do Elefante, Serra de Baixo, morro lado direito na estrada para a Pedra do Elefante, inselberg,

18°46'12" S, 40°26'51" W, 300-600 m, 14 January 2009, bud, *A.P. Fontana 5769* (MBM, MBML!). Santa Teresa: Estação Biológica de Santa Lúcia, abaixo da cachoeira, 11 May 2000, fr., *V. Demuner 1047* (MBML!); Estação Biológica de Nova Lombardia, 850 m, 19 February 2002, fl., *L. Kollmann 5562* (CEPEC, MBML, SP);

Additional specimen examined:—BRAZIL. Bahia, Maracás, 13 a 22 Km sul de Maracás, pela Estrada velha de Jequié. 27 April 1978. bud, fl., *S.A. Mori s.n.* (NY 475421).

Notes:—*Byrsonima nitidifolia* is endemic of Brazil, occurs in the state of Pernambuco, Bahia, Ceará and Espírito Santo in the domain of the Atlantic Forest, Cerrado and Caatinga (Francener 2020). *Byrsonima nitidifolia* is characterized by leaf blades oblong, elliptic to lanceolate, shiny abaxially, bracts ca. 2.5 mm long, non-reflexed, bracteoles ca. 1.8 mm long, drupes ca. 8 mm, smooth. It resembles *B. perseifolia* but this one has smaller bracts and bracteoles (ca. 1.5 and 1 mm respectively) and bigger petioles (ca. 12 mm).

14. *Byrsonima perseifolia* Grisebach (1839: 257). Figura 4D.

Trees, 12–20 m tall. *Stipules* 2.2–4.2 × 0.8–1.7 mm, triangular to lanceolate. *Leaf blades* 6.27–11.2 × 2.8–4.5 cm, elliptic, base attenuate to cuneate, margins flat to slightly revolute and undulate, apex acute, acuminate falcate to rounded, both side glabrous, midrib prominulous on abaxial side and impress on adaxial side, principal lateral veins ca. 12, prominulous abaxially and impress adaxially; petioles 6–18.5 × 0.9–1.5mm, glabrescent to slightly sericeous. *Thyrse* of 1-flowered cincinnus, with ca. 25 flowers, main axis 5.7–9.37 cm long, slightly sericeous; bracts 1.2–2 × 0.4–0.8 mm, ovate to triangular, on both sides tomentose, sericeous to glabrescent, non-reflexed; peduncles 0–1.8 × 0–0.6 mm; bracteoles 0.8–2 × 0.5–0.8 mm, ovate to triangular, non-reflexed; pedicels 2.6–10.5 × 0.5–1 mm,

tomentose to sericeous; sepals $0.8\text{--}3 \times 0.5\text{--}2.5$ mm, abaxial side tomentose to sericeous, adaxial side glabrous, glabrescent to slightly sericeous, margin revolute on apex at anthesis, triangular to widely ovate, not accrescent on the drupes; glands $0.9\text{--}2.5 \times 0.5\text{--}1$ mm; all petals white to pink in age, lateral petals with blades $3.1\text{--}5.1 \times 2.3\text{--}5.4$ mm, claws $1.5\text{--}2.3 \times 0.4\text{--}0.6$ mm, margin slightly erose; posterior petal blades $2.5\text{--}3.1 \times 2\text{--}3.5$ mm, claws $2.1\text{--}3 \times 0.5\text{--}0.8$ mm, margin erose. *Stamens* free, homomorphic, anthers glabrous to glabrescent, connectives $1.1\text{--}1.7 \times 0.5\text{--}0.6$ mm, surpassing the anther sacs (0–0.3 mm length); filaments $1.1\text{--}2.1 \times 0.3\text{--}0.4$ mm, sericeous at base. *Ovary* glabrous, style $2.4\text{--}3.4 \times 0.2\text{--}0.4$ mm. *Drupes* 8–9 mm diam., glabrous, verrucous, globose.

Specimens examined:—BRAZIL. Espírito Santo. Barra de São Francisco: Cabeceira Córrego do Engenho, terreno de Alfredo Bassi, 235 m, 12 December 2000, bud, *L. Kollmann* 3476 (MBML!). Domingos Martins: BR 262, próximo a Vitor Hugo, Rio Jucu, braço sul, 17 January 1995, fl., *G. Hatschbach* 61600 (MBM, MBML!). Linhares: Reserva Natural Vale, 20 December 1978, bud, fl., *I.A. Silva* 37 (CVRD!, HUFSJ!). Santa Teresa: Reserva Biológica de Nova Linhares, December 1989, bud, *L.P.S. Pinto s.n.* (BHCB! 18657, MBML! 5835). Limoeiro, Castelo, 7 July 1996, fr., *G. Hatschbach* 65262 (MBM).

Notes:—*Byrsonima perseifolia* is endemic of Brazil, occurs in the states of Minas Gerais, Rio de Janeiro, Espírito Santo and São Paulo, in the domain of the Atlantic Forest and Cerrado (Francener 2020). Its main features are small bracts and bracteoles (ca. 1.5×0.5 mm), erect, just like the flower buds, very small or absent peduncle, large petiole, white petals, elliptical leaves, often with undulate margins. It resembles *B. alvimii* and *B. cacaophila*, but *B. alvimii* has larger and reflexed bracts and *B. cacaophila* has a peduncle ca. 3 mm long.

15. *Byrsonima sericea* De Candolle (1824: 580). Figure 3D.

Shrubs to small trees, 1.7–4 m tall. *Stipules* 1.1–4 × 1–2 mm, triangular, lanceolate to ovate. *Leaf blades* 2.37–9.23 × 1–4.17 cm, obovate, elliptic to lanceolate, base attenuate to cuneate, margins flat to slightly revolute, apex acute, acuminate, mucronulate, apiculate to cuspidate, abaxial side densely sericeous to sericeous, adaxial side glabrous, glabrescent to slightly sericeous on midrib, midrib prominulous on side abaxial and impress on side adaxial, principal laterals veins prominulous on side abaxial and impress on side adaxial and number of 9–21; petiole 3–8.7 × 1–1.8 mm, glabrescent, sericeous to densely tomentose. *Thyrse* of 1–2-flowered cincinnus, ca. 20 flowers, main axis 3–8.53 cm long, sericeous; bract 1.2–2 × 0.4–1.8 mm, lanceolate to triangular, abaxial side glabrescent, sericeous to tomentose, adaxial side glabrous, glabrescent, sericeous to tomentose, non-reflexed; peduncle 0–1 × 0–0.8 mm; bracteoles 0.7–1.4 × 0.4–1 mm, triangular, non-reflexed; pedicels 5.2–10 × 0.4–1 mm, sericeous; sepals 2–2.9 × 1.3–2.2 mm, abaxial side sericeous to slightly sericeous, adaxial side glabrous, glabrescent to sericeous, margin flat to slightly revolute at anthesis, triangular, ovate to widely ovate, not accrescent on the drupes; glands 1.5–2.3 × 0.6–1 mm; all petals yellow becoming red to orange in age, lateral petals blade 2.7–5 × 5–5.2 mm, claw 2–2.6 × 0.3–0.6 mm, margin erose; posterior petal blade 2.9–3.4 × 3.1–4.3 mm, claw 2.7–3.4 × 0.8–1 mm, margin erose. *Stamens* free to connate at base, homomorphic, anthers glabrous to slightly sericeous, connectives 1.7–2.4 × 0.4–0.7 mm, surpassing the anther sacs (0–0.2 mm length); filaments 1.5–2.1 × 0.3–0.6 mm, sericeous at base. *Ovary* glabrous to sericeous, style 2.7–3.3 × 0.2–0.3 mm. *Drupes* 4–6.8 × 3–6.6 mm, glabrous, glabrescent to slightly sericeous, verrucous, globose.

Specimens examined:—BRAZIL. Espírito Santo. Anchieta: Samarco, Área A, 26 July 2000, fr., *J. Dalmaschio s.n.* (MBML! 13439). Colatina: Alto Moacir, Pedra do Cruzeiro, 19°20'53" S, 40°33'3" W, 150–850 m, 17 April 2006, fl., fr., *L.F.S. Magnago 796* (MBML!).

Governador Lindenberg: Pedra de Santa Luzia, 19°16'54" S, 40°27'43" W, 350-650 m, 26 April 2007, fr., *V. Demuner* 3865 (MBML!). Linhares: Pontal de Ipiranga, Degredo, 1 April 2007, fr., *L. Kollmann* 9594 (MBML!); Reserva Biológica de Comboio - IBAMA, Regência, 08 July 1988, bud, fr., *G.L. Farias* 197 (CVRD!); Reserva Biológica de Comboio - IBAMA, Regência, próx. ao mar, 50 m do mar, 10 m da estrada, lado esquerdo, Souza, 12 June 1991, fl., *V.D. Souza* 106 (CVRD!); Reserva Natural Vale, 21 December 1981, bud, fl., *I.A. Silva* 282 (CVRD!, HUFSJ!); *ibidem*, 12 June 1991, bud, fl., *L.P. Queiroz* 2481 (CVRD!, HUFSJ!); Sooretama, sede, perto da lagoa, 15 February 1972, bud, *s.col. s.n.* (MBML! 2910); Marilândia: Liberdade (Água-Viva, Pedra do Cruzeiro), 19°20'53.7" S, 40°33'03.6" W, 150-650 m, 18 January 2006, *V. Demuner* 1595 (MBML!). Praia das Neves, divisa com o estado do Rio de Janeiro, 9 February 1996, fl., fr., *C.N. Fraga* 292 (MBML!); Praia das Neves, 2 November 1987, bud, fl., *J.M.L. Gomes* 164 (VIES!); Presidente Kennedy: Propriedade da FERROUS, próximo à Praia das Neves, 21°12'52" S, 40°59'23" W, 14 January 2010, bud, *Maielo-Silva* 116 (RB!). Santa Leopoldina: Luxemburgo, Pedra Preta, 15 March 2005, fl., fr., *L. Kollmann* 7403 (MBML!). São Mateus: Reserva Biológica do Projeto TAMAR, Guriri, 11 April 1991, fr., *V.D. Souza* 62 (CVRD!, HUFSJ!). São Roque do Canaã: Misterioso, fim da estrada, 24 December 2003, fl., *A.P. Fontana* 664 (MBML!). Vila Velha: Barra do Jucu, 14 April 1986, fl., *L.C. Fabris* 37 (VIES!); Morada do Sol, 20°27'43.7" S, 40°20'35.2" W, 3 m, 14 January 2006, fl., *F.A.R. Matos* 54 (MBML!).

Notes:—*Byrsonima sericea* occurs in Bolivia, Brazil, French Guiana, Guyana, and Peru. In Brazil is widely distributed, especially on the coast, from São Paulo to Pará, in the domain of the Amazonia, Caatinga, Cerrado, and Atlantic Forest (Francener 2020). *Shrubs to small trees characterize Byrsonima sericea*, but we found an unusual specimen with 15 m high. Its main feature is the abaxial side of the leaves densely sericeous with adpressed hairs. It resembles *B. chrysophylla*, as discussed in item 2.2 in excluded species.

16. *Byrsonima stipulacea* A.Jussieu (1840: 332). Figure 3B.

Trees, 5–25 m tall. *Stipules* 5–25 × 2–7.8 mm, triangular, lanceolate to ovate, amplexicaul, deciduous. *Leaf blades* 5–19 × 1.7–12 cm, obovate to elliptic, base attenuate to cuneate, margins flat to slightly revolute, apex acute, acuminate to rounded, abaxial side densely tomentose, tomentose to velutine (stellate and stalked hairs), adaxial side glabrous, glabrescent, slightly tomentose, slightly velutine to tomentose, stellate-stalked hairs, midrib prominulous on side abaxial and impress on side adaxial, principal laterals veins prominulous on side abaxial and impress on side adaxial and number of ca. 10; petiole 8–23 × 1.8–3 mm, velutine to densely tomentose. *Thyrse* of 1-2-flowered cincinnus, 15–75 flowers, main axis 7–17 cm long, velutine; bract 2.2–10.4 × 1–2.2 mm, lanceolate to triangular, abaxial side velutine, tomentose to densely tomentose, adaxial side glabrous, glabrescent to slightly velutine, non-reflexed; peduncle 0–2.2 × 0–1.5 mm; bracteoles 2.2–5 × 1.4–2.9 mm, triangular, ovate to lanceolate, non-reflexed; pedicels 2–16.9 × 1–1.5 mm, densely tomentose to velutine; sepals 2.9–8.5 × 1.2–5.3 mm, abaxial side densely tomentose, tomentose to densely velutine, adaxial side tomentose to slightly tomentose, margin revolute at anthesis, triangular, ovate to lanceolate, not accrescent on the drupes; glands 1.7–3.2 × 0.7–1.7 mm; petals yellow turning red to orange in age, lateral petals blade 4.2–5.3 × 5.1–7.2 mm, claw 3–3.6 × 0.4–0.7 mm, margin slightly erose to erose; posterior petal blade 2.4–3.4 × 2.3–3.8 mm, claw 3.3–4.2 × 0.5–0.9 mm, margin erose. *Stamens* connate at base, homomorphic, anthers sericeous, connectives 1.8–3.5 × 0.3–1.2 mm, surpassing the anther sacs (0.4–1.1 mm length); filaments 1.5–4 × 0.5–0.7 mm, sericeous at base. *Ovary* sericeous, style 1.8–3.7 × 0.2–0.4 mm. *Drupes* 9–22.7 × 7.2–21 mm, glabrescent, tomentose to densely tomentose, smooth, globose to ovoid.

Specimens examined:—BRAZIL. Espírito Santo. Aracruz: Estrada para Santa Rosa, 19°53.32' S, 40°16.58' W, 4 April 2007, bud, *H.C. Lima 6599* (RB!); Reserva do Putiri,

19°82'03" S, 40°27'33" W, 10 May 1994, fr., *J.N. Neves 1* (VIES!). Fundão: Goiapaba-Açu, 700 m, 15 July 1998, fr., *L. Kollmann 255* (MBM, MBML!). Linhares: OCEMADE, 1 February 1972, fl. *D. Sucre 8353* (RB!); Fazenda Trajano, 100 m da sede da fazenda em linha reta, 6 February 1991, bud, fl., *V.D. Souza 15* (CVRD!, HUFSJ!); Flona de Goytacazes, 9 April 2011, fr., *J.M.L. Gomes 3864* (VIES!); Flona de Goytacazes, perto da sede, 23 April 2011, bud, *J.M.L. Gomes 3714* (VIES!). Reserva Biológica de Sooretama, 12 May 1985, fr., *G. Martinelli 10962* (MBML!, RB!); Reserva da Companhia Vale do Rio Doce, 8 April 2006, bud, *G.O. Romão 1282* (CVRD!, RB!); Reserva da Companhia Vale do Rio Doce, Estrada MME, 24 July 2006, fr., *J. Paula-Souza 6358* (RB!); Reserva Florestal de Linhares, próximo Estrada 154, 7 March 1972, fr., *A.M. Lino 17* (CVRD!, RB!); Reserva Natural da Vale, Sooretama, 19°08'32.1" S, 40°03'58.1" W, 38 m, 02 February 2013, bud, *M.G. Caxambu 4553* (RB!); Reserva Natural Vale, 9 January 1982, bud, fl., *I.A. Silva 309* (CVRD!, HUFSJ!); *ibidem*, 16 August 1991, fr., *V.D. Souza 129* (CVRD!) *ibidem*, 19 September 1991, fr., *D.A. Folli 1416* (CVRD!, HUFSJ!); *ibidem*, 17 April 2011, fr., *D.F. Lima 207* (RB!); Reserva Natural Vale do Rio Doce (particular), próximo a estrada X-I, Talhão 606, 8 March 1972, bud, fr., *J. Spada 20* (RB!); Reserva Natural Vale, Estrada Gávea, 19°11'S 39°54'W, 9 February 1999, bud, fl., *R. Mello-Silva 1546* (BHCB!, CVRD!, RB!, HUFSJ!). Santa Leopoldina: Fazenda Caioaba, 20°3'33" S, 40°28'14" W, 150-650 m, 17 July 2007, fr., *R.R. Vervloet 2909* (MBML!); Fazenda Caioaba, prop: Virloni, trilha do Córrego Caioaba, 20°3'33" S, 40°28'14" W, 150-650 m, 8 August 2006, fr., *L.F.S. Magnago 1241* (MBML!); Pedra Branca, mata na Serra Santa Lúcia, prop: Cristiano Bremencampi, 20°12'2" S, 40°29'26" W, 250-380 m, 18 April 2007, fl., *V. Demuner 3622* (MBML!); Serra do Ramallete, prop: Cláudio Virloni, trilha do Córrego Caioaba, 20°03'30.8" S, 40°28'14.3" W, 200-500 m, 15 February 2006, bud, fl., *V. Demuner 1833* (MBML!); *ibidem*, 4 April 2008, fl., fr., *L. Kollmann 10794* (MBML!); Suíça, 20°5'417" S, 40°35'351" W, 460 m, 12 April 2008,

fl., *M. Simonelli 1481* (MBML!). Santa Teresa: Bairro do Eco, mata do Banestes, 650 m, 22 October 1998, fr., *L. Kollmann 769* (MBML!); Penha, mata do Tabajara, 22 March 2005, fl., *L. Kollmann 7528* (MBML!); Rio Saltinho, estrada para Goiapaba-Açu, 350 m, 29 August 2001, fr., *L. Kollmann 4404* (MBML!); Santo Antônio, terreno do Boza, 850 m, 27 April 1999, fl., *L. Kollmann 2536* (MBML!); Valsugana Velha, Estação Biológica Santa Lúcia, 19°58' S, 40°32' W, 600-900 m, 15 May 1991, fl., *W. Pizziolo 352* (MBML!). Sooterama: Reserva Florestal da Companhia Vale do Rio Doce, 23 February 2000, fl., *A.M Amorim 3355* (CVRD!, MBML!).

Notes:—*Byrsonima stipulacea* occurs in Bolivia, Brazil, French Guiana, Guyana, Peru, Suriname, and Venezuela. Its distribution in Brazilian territory goes from the northern, southeastern, and some northeastern states, in the domain of the Atlantic Forest and Amazonia (Francener 2020). *B. stipulacea* has stellate-stalked hairs admixture with simple hairs, also large stipules (ca. 4 mm long), sometimes deciduous. It resembles *B. duckeana* as discussed in item 2.3 in excluded species.

17. *Byrsonima vernicosa* Niedenzu (1901: 33). Figure 3C.

Trees, 8–15 m tall. *Stipules* 2.5–5.5 × 1.4–3.4 mm, triangular, lanceolate to ovate. *Leaf blades* 2–9.1 × 1–4.9 cm, obovate to elliptic, base attenuate to cuneate, margins flat, slightly revolute to revolute, apex acute, acuminate, retuse, apiculate to rounded, abaxial side densely tomentose to tomentose, adaxial side glabrescent to tomentose on midrib, midrib prominulous on side abaxial and prominulous to impress on side adaxial, principal laterals veins prominulous to impress on side abaxial and impress on side adaxial and number of ca. 10; petiole 0.95–7.8 × 1–2.6 mm, glabrescent, tomentose to densely tomentose. *Thyrse* of 1-flowered cincinnus, ca. 25 flowers, main axis 3.87–11.14 cm long, densely tomentose; bract

1.4–4 × 0.6–1.4 mm, lanceolate, triangular to ovate, abaxial side tomentose, adaxial side glabrescent, non-reflexed; peduncle 1.5–5.3 × 1–1.7 mm; bracteoles 1.3–2.3 × 0.8–2 mm, triangular, ovate to lanceolate, non-reflexed; pedicels 1.6–11 × 1–1.7 mm, densely tomentose; sepals 3–5.1 × 2–4.2 mm, abaxial side densely tomentose to tomentose, adaxial side glabrescent to tomentose, margin flat after anthesis, widely triangular, ovate to widely ovate, not accrescent on the drupes; glands 1.1–3.4 × 0.8–2.3 mm; all petals white becoming pink in age, blade 5.2–6.5 × 5–6.3 mm, claw 2.4 × 0.6 mm, margin erose; posterior petal blade 3.4–3.9 × 2.7–4.3 mm, claw 2.7–3.5 × 0.5–0.6 mm, margin erose. *Stamens* connate at base, homomorphic, anthers glabrous, connectives 1.5–2.4 × 0.4–0.8 mm, surpassing or not the anther sacs (ca. 0.1 mm length); filaments 2.5–3.1 × 0.3–0.5 mm, glabrescent to sericeous at base. *Ovary* glabrous, style 3.2–3.5 × 0.3–0.5 mm. *Drupes* 9.6–12 × 10–13.8 mm, glabrous to slightly sericeous at apex, verrucous, discoid.

Specimens examined: BRAZIL. Espírito Santo. Castelo: Parque Estadual do Forno Grande, trilha da balança, 20°31'37" S, 41°06'6" W, 1250–1600 m, 18 July 2008, fr., *R. Goldenberg 1177* (MBM, MBML!). Santa Maria de Jetibá: Rio das Pedras, terreno de Paulo Kuzanki (área 2), 700 m, 20 January 2003, bud, fr., *L. Kollmann 5921* (MBML!, MICH); Rio Nove, ter. L. Kollmann, 24 February 2000, bud, fl., fr., *V. Demuner 778* (ESA, MBML!). Santa Teresa: Estação Biológica Santa Lúcia, 650–800 m, 8 December 1992, st., *L.D. Thomaz 985* (MBML!, VIES!); *ibidem*, 7 March 1995, fl., *L.D. Thomaz 987* (MBML!, VIES!); Estação Biológica Santa Lúcia, trilha do palmitreiro, 27 January 2000, bud, *V. Demuner 637* (MBML!); Nova Lombardina, Reserva Biológica Augusto Ruschi, 800 m, 4 October 2001, fr., *L. Kollmann 4801* (MBML!); Nova Lombardina, Reserva Biológica Augusto Ruschi, cabeceira do rio Saltinho, 800 m, 13 March 2002, fl., *L. Kollmann 5646* (MBML!); Nova Lombardina, Reserva Biológica Augusto Ruschi, divisa, 800 m, 21 January 2003, bud, fl., fr., *R.R. Vervloet 1688* (MBML!); Nova Lombardina, Reserva Biológica Augusto Ruschi, linha

de divisa, lado direito, saída para João Neiva, 6 March 2003, fl., *R.R. Vervloet 1940* (MBML!); Reserva Biológica Augusto Ruschi, primeira divisa à esquerda, 750 m, 8 January 2002, bud, *L. Kollmann 5212* (MBML!); Santo Antônio, terreno do Boza, 850 m, 16 March 1999, fl., *L. Kollmann 2164* (MBML!). São Roque do Canaã: Alto Misterioso, 973 m, 25 November 2007, bud, *M. Simonelli 1363* (MBML!).

Notes:—*Byrsonima vernicosa* is endemic to Brazil, occurring in the state of Espírito Santo and Rio de Janeiro, in the domain of the Atlantic Forest (Francener 2020). It is characterized by the main axis, pedicels and abaxial side of leaves densely tomentose to tomentose and drupes ca. 12 mm diam, verrucous. It resembles *B. variabilis*, as discussed later under excluded species.

Excluded species

1. *Byrsonima blanchetiana* Miquel (1850: 799).

The collection *F.A.G. Guilherme 391* (MBML) was cited in the speciesLink database (2020) under this name; nevertheless, we examined this specimen and identified it as *Byrsonima myricifolia*, as it has leaf blades, pedicels, and main axis glabrous, while *B. blanchetiana* is characterized by presenting the abaxial surface of the leaves persistently sericeous.

2. *Byrsonima chrysophylla* Kunth (1822: 150).

There are 20 collections identified as *B. chrysophylla* in the state of Espírito Santo in the speciesLink database (2020), 17 of which were analyzed (in person or by photos) by us and indeed are, in our opinion, *B. sericea*. Anderson 1981 added a characteristic peculiar to *B. chrysophylla*, one or two glands in the claw at the posterior petal, and repeats this comment in

2001, but the same author finds this same characteristic for *B. sericea*, in his work on Flora do Pico das Almas (Anderson 1995a). After study and analysis of the types and previous works (Kunth 1822, Jussieu 1833, Jussieu 1843, Anderson 1995a), we concluded that despite so many similarities, these two species can be separated by the characteristics below, until revisional studies are done:

1. Persistent sericeous sign on the leaf's abaxial side, parallel trichomes; Southeast and Midwest

Brazil.....*B. sericea*

-. Sericeous or tomentose on the abaxial side of the leaves, “deranged” trichomes; Amazon region..... *B. chrysophylla*

Based on the above information, we cannot confirm the presence of *B. chrysophylla* for the state of Espírito Santo.

3. *Byrsonima duckeana* W.R.Anderson (1995b: 20). 1995.

This species is related to *Byrsonima stipulacea* but has sessile or subsessile stellate hairs and stipules are persistent and smaller. 95% of the species identified in the speciesLink database (2020) are from the Amazon region. For Espírito Santo state we have two collections, *J. Spada 162* (RB, SP), that were examined and received new identification as *Byrsonima crassifolia* and *Maielo-Silva 116* (RB!) that was examined and received new identification as *Byrsonima sericea*.

4. *Byrsonima gardneriana* A.Jussieu (1843: 296).

Three collections are identified as *B. gardneriana* to the state of Espírito Santo in the speciesLink database (2020). We analyzed the collection *Demuner 741* (MBML!) and identified it as *B. intermedia*, since this collection has few trichomes in the midvein abaxially, while in *B. sericea* the entire abaxial surface of the blades is densely and persistently sericeous. The collections *Kollmann 5562* (MBML!) and *Demuner 3976* (MBML!) were analyzed and identified as *B. nitidifolia*.

According to Niedenzu (1928), the difference between *B. gardneriana* and *B. nitidifolia* is the shape and apex of the leaves, as well as the size. Rolim (2004) considered these two species to be synonymous, once the characteristics of the petiole size and leaf apex shape that could differentiate the species are taxonomically fragile. These characteristics were mixed in the analyzed exsiccates and no other consistent character was found to delimit the species. In addition, they are sympatric.

After study and analysis of the types and previous works, we concluded that, despite so many similarities, these two species can be separated by the characteristics below, until revisional studies are done:

1. Leaves 2–5 cm long, cuneate-obovate; apex submarginate to emarginate.....*B. gardneriana*
- . Leaves 3–6 cm long, lanceolate-obovate or elliptic; apex obtuse to acuminate*B. nitidifolia*

Based on the above information, we cannot confirm the presence of *B. gardneriana* for the state of Espírito Santo.

5. *Byrsonima laxiflora* Grisebach (1839: 256).

There are three collections identified as *B. laxiflora* for the state of Espírito Santo in the speciesLink database (2020). The collections *Folli 4289* (HUFSJ!) and *Folii 5045* (HUFSJ!), were analyzed and identified as *B. crassifolia*, by its thick leaves, very small or suppressed stalk and fruits ca. 16 mm in diameter. The collection *Hatschbach 51336* (MBM) was analyzed and identified as *B. ligustrifolia* by its elliptical leaves, slightly tomentose to glabrescent on the abaxial side of the blade, verrucous and pedunculated fruits.

6. *Byrsonima pedunculata* W.R. Anderson (1997: 51).

There are two collections identified as *B. pedunculata* for the state of Espírito Santo in the speciesLink database (2020). The collection *Hatschbach 61600* (MBML!), in one of its nine duplicates, was identified as *B. pedunculata*. Nevertheless, due to its small bracts and bracteoles (ca. 1.5 × 0.5 mm), erect just like the flower buds, very small or absent peduncle (less than 3 mm), white petals, large petioles, and elliptical leaves, often with undulate margins, we consider it as *B. perseifolia*. The collection *Magnago 942* (MBML!) was analyzed and received a new identity as *B. ligustrifolia* for a very peculiar characteristic described by Rolim (2004): claw of the posterior yellow petal. *Byrsonima pedunculata* has inflorescences up to 14 cm long with flowers absent from the proximal 3 cm of the axes. *B. pedunculata* is close to *B. cacaophila*, which resembles it not only in having long peduncles often bearing more than one flower, but also in it is similarly shaped bracts and bracteoles, white petals and the sericeous anthers with connectives not surpassing the anther sacs. *Byrsonima pedunculata* has smaller leaves and petioles than *B. cacaophila*; its bracts and bracteoles are deciduous past maturity of the fruit, and its calyx glands (2.5–3.1 mm) and filaments (2–2.2 mm) are smaller (Anderson 1997).

7. *Byrsonima verbascifolia* (Linnaeus 1753: 426) De Candolle (1824: 579).

There is one collection from Espírito Santo identified under this name in the speciesLink database (2020); we examined this collection (*Vinha 1422*, VIES!), but it was sterile, which made it impossible to confirm the diagnostic characteristics of the species. At the moment, we were not able to confirm the occurrence of *B. verbascifolia* in Espírito Santo.

8. *Byrsonima variabilis* A.Jussieu (1833: 78).

Byrsonima variabilis is related to *Byrsonima vernicosa*; the two species are mainly distinguished by their size. While *B. variabilis* is a shrub to 1.5 m, *B. vernicosa* is a tree; additionally, *B. variabilis* is characteristic of *Campos de altitude* especially along the Espinhaço Range, while *B. vernicosa* occur in coastal Rainforests; the main characteristic used to separate them is plant size. Two collections (*Thomaz 985*, MBML! and *Thomaz 987*, MBML!) were cited in herbaria under this name, but based on our observations, both belong to *B. vernicosa*.

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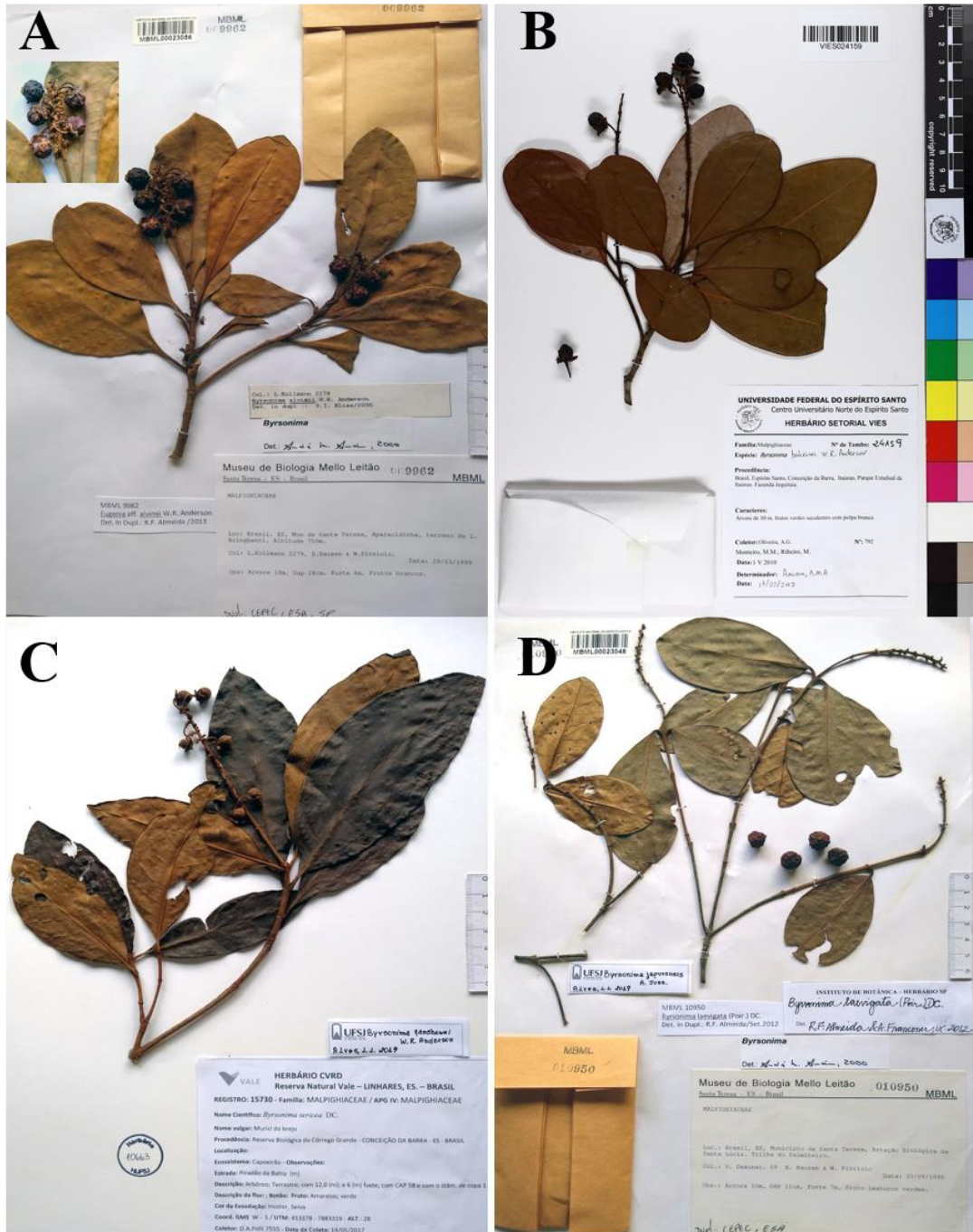


Figure 1: A. *Byrsonima alvimii* (Kollmann 2279, MBML) B. *Byrsonima bahiana* (Oliveira 792, VIES), C. *Byrsonima fanshawei* (Folli 7555, HUFSJ), D. *Byrsonima japurensis* (Demuner 59, MBML).

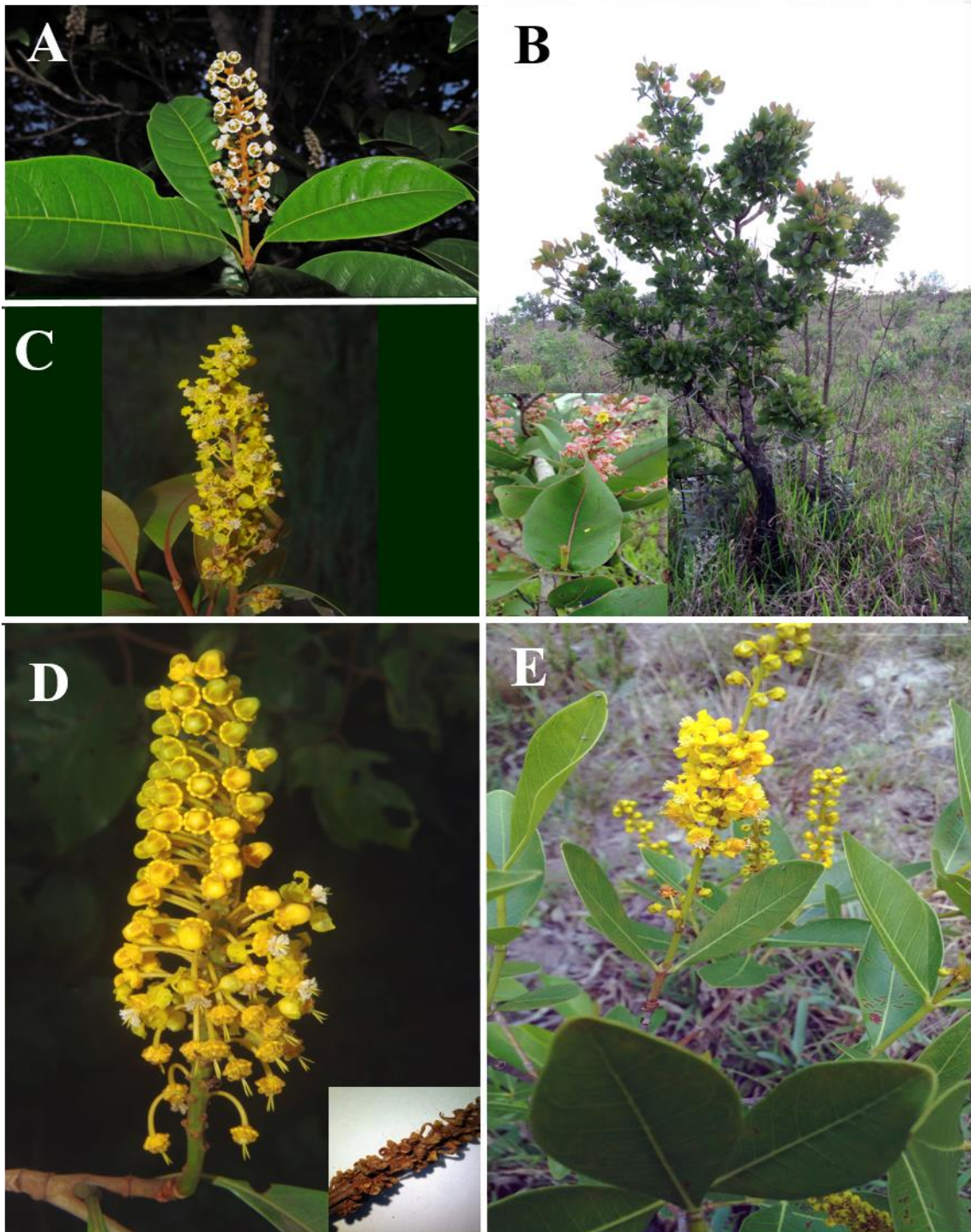


Figure 2: A. *Byrsonima cacaophila* (photo by F. Flores), B. *Byrsonima coccolobifolia* (photos by L.L. Alves), C. *Byrsonima crassifolia* (photo by C.F. Hall), D. *Byrsonima crispa*, detail of bracts and bracteoles strongly reflexed (photo by C.F. Hall), E. *Byrsonima intermedia* (photo by L.L.Alves).

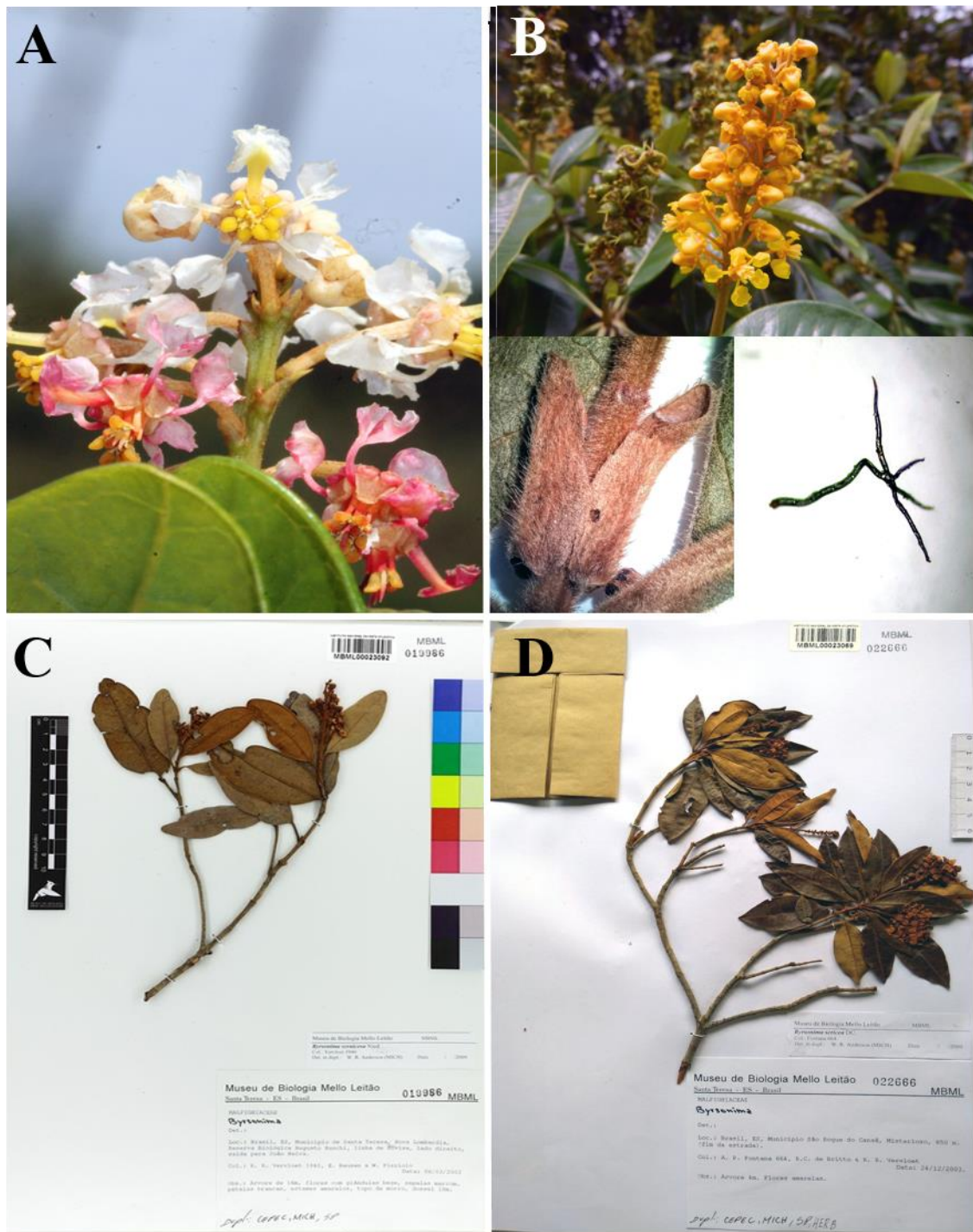


Figure 3: A. *Byrsonima ligustrifolia* (photo by R.F. de Almeida), B. *Byrsonima stipulacea*, detail of the amplexicaule stipules and star-shaped trichome (photo by M. Pastore), C. *Byrsonima vernicosa* (Vervloet 1940, MBML), D. *Byrsonima sericea* (Fontana 664, MBML)



Figure 4: A. *Byrsonima myricifolia* (Kollmann 3901, MBML), B. *Byrsonima niedenzuiana* (Martinelli 10947, RB), C. *Byrsonima nitidifolia* (Demuner 1047, MBML) D. *Byrsonima perseifolia* (Silva 37, CVRD)

**ARTIGO 03: PINK- AND WHITE- FLOWERED SPECIES OF *BYRSONIMA*
(MALPIGHACEAE) FROM ESPINHAÇO RANGE, BRAZIL
NORMAS DO PERIÓDICO PHYTOTAXA (VERSÃO SUBMETIDA)**

**Pink- and white- flowered species of *Byrsonima* (Malpighiaceae) from Espinhaço Range,
Brazil**

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Abbreviated title: *Byrsonima* from the Espinhaço Range, Brazil

Abstract

We present a floristic survey for the pink- and white-flowered species of *Byrsonima* from Espinhaço Range. Twenty species from this group are recorded for the study area. An identification key for all species is presented, along with morphological descriptions, photo plates and ecological and taxonomical comments. Additionally, conservation assessments for ten species are presented

Keywords:— Byrsonimoid clade, Campos Rupestres, Cerrado, Malpighiales, Taxonomy.

Introduction

Malpighiaceae comprising 77 genera and ca. 1300 species of trees, shrubs, subshrubs, or lianas, with pantropical distribution, but predominantly in the Neotropics (Davis & Anderson 2010; POWO 2021). This family is easily identified due to the conspicuous floral conservatism of its flowers, represented by a pair of oil-secreting glands on each sepal, and clawed petals (Davis & Anderson 2010).

Byrsonima Rich. ex Kunth (1822: 147) is the second largest genus of Malpighiaceae, with ca. 135 Neotropical species mostly distributed in rainforests and savannas (Anderson *et al.* 2006). Its species are usually subshrubs, shrubs, or trees, with leaves lacking extra-floral nectaries, 1-flowered cincinnus arranged in a terminal, erect thyrses, calyces with ten oil glands (or rarely absent), petals glabrous, white, yellow, or pink, ten stamens, three subulate styles, and drupaceous fruits (Anderson 1981; Mamede 1987; Francener 2016).

Niendenzu (1901) divided the genus into two subgenera based on the length of the connective in relation to the length of the anther sacs: *Byrsonima* subg. *Macrozeugma* and *Byrsonima* subg. *Byrsonima*. Most species of *Byrsonima* subg. *Macrozeugma* have flowers with white or pink petals, connective stamens developed, exceeding the apex of the anther sacs by more than a quarter of their length, while *Byrsonima* subg. *Byrsonima* have flowers with yellow petals and connective usually not surpassing the anther sacs or surpassing them less than a quarter of their length.

Brazil is the country with the largest number of *Byrsonima* species, with 99 recognized species (Francener 2020). Within its area, the Amazon and Cerrado domains are the most diverse (ca. 51 and 49 species respectively), followed by the Atlantic Forest with ca. 27 species (Francener 2020). Throughout the Cerrado domain, Espinhaço Range can be recognized as a large area of distribution for *Byrsonima*, with ca. 38 species, of which 22 are from *Byrsonima* subg. *Byrsonima* and 16 from *Byrsonima* subg. *Macrozeugma* (personal observations).

Espinhaço Range is marked, in practically all its extension, by an ancient human occupation linked to the extraction of gold or diamonds and its associated activities. It is also subject to frequent fires. At some points, its flora is being replaced by monocultures of eucalyptus and pine. In others, mainly close to urban centers, the increase in the number of summer hostels is astonishing (Rapini *et al.* 2008). The awareness that the flora on Espinhaço Range suffer is not recent and must be reinforced with each new survey.

To further the floristic knowledge of Espinhaço Range, we present a taxonomic treatment of *Byrsonima* with pink and white petals, which includes *Byrsonima* subg. *Macrozeugma* and some species of *Byrsonima* subg. *Byrsonima* with pink petals and yellow

posterior petal, including a key for identifying species, morphological descriptions, specimens examined, photo plates, and comments on distribution and taxonomy of all species.

Material and Methods

Study area

The Espinhaço Range extends in a south-north direction between the parallels 10°30' to 20°30'S, from the Quadrilátero Ferrífero, in the center of Minas Gerais state, to Chapada Diamantina, in Bahia state (Fig. 1). It constitutes a set of mountains that extends over 1,200 km, with two very individualized sectors: the northern portion, represented by Chapada Diamantina, and the southern portion, fully inserted in Minas Gerais state, which extends for 300 km, with a width average of 20 km.

The diversity of the Espinhaço Range is recognized by the creation of dozens of state and municipal Conservation Units (UCs) and at the federal level, such as Chapada Diamantina National Park, at the northern end of the Espinhaço mountain range (Bahia), the Sempre Vivas National Park, in the northern portion of the southern sector of the Espinhaço Range (Minas Gerais), and the Serra do Cipó National Park, close to the city of Belo Horizonte (Minas Gerais)

Above the steep slopes, extensive plateaus predominate, punctuated by rocky elevations, giving source to extensive meadows on flat or smooth-undulating relief, the rock fields ou “campos rupestres”, with altitudes between 1200 and 1400 m. They are characterized by great geological and geomorphological complexity, which leads to the succession of different rocks and soils in small spaces and rugged relief, which partly explains the high diversity of plant species (Giulietti et al. 1997; Menezes & Giulietti 2000).

Taxonomy

We have recorded 24 species of pink- and white-flowered *Byrsonima* for the Espinhaço Range. This number was obtained through filters on the online platform speciesLink (2020), using keywords from the main cities and mountains that make up the Espinhaço Range. Along this study we concluded that the present number of species were 20; four species were excluded and are discussed at the end of the paper.

We analyzed 87 specimens from physical (labeled with an exclamation mark “!”) and virtual herbaria, namely ALCB, HUEFS, HUFJSJ, BHCB, RB, MBM, MBML, K, P, RB (acronyms according to Thiers 2021). Vegetative morphological terminology follows Radford *et al.* (1974), but the terminology for trichomes follows Anderson (1981); reproductive morphological terms follow Niedenzu (1928) and Anderson (1981). The measurement results were taken according to the standard length x width (or diameter). When the collections had the project’s number instead of the collector's number, these were placed before the collector's data. We used in the descriptions the smallest and the largest value of the variables. Species were described in alphabetical order. The threat classification was not placed in the notes of species whose degree of threat was not assessed by CNCFlora (2021). Comparisons between species were made only with the species included in this work, therefore for the same study area (20 species found and four species excluded). All figures were processed using Photoshop and Power Point, the map was elaborated using the QGIS (QGIZ 2021).

Results and discussion

Of the 20 species found in the study area, 16 belong to *Byrsonima* subg. *Macrozeugma*, as they have all pink petals, and four belong to *Byrsonima* subg. *Byrsonima* because they have pink lateral petals and yellow posterior petal. The main criterion used by Niedenzu in 1897 to

separate the subgenera is the proportion between the connectives and the anther sacs. Nevertheless, this character did not proved consistent in all species assigned to *Byrsonima* subg. *Macrozeugma*, and we conclude that this criterion should be analyzed in more detail in a future revision of the genus. Regarding the four additional species with pink lateral petals and yellow posterior petal, we chose to include these in our treatment due to the lack of information in the literature about these species.

Key to pink- and white-flowered *Byrsonima* form the Espinhaço Range

1. All petals white to pink.....2
 - . Posterior petal yellow to red, lateral petals white to pink.....17
2. Leaves glabrous to glabrescent on both sides or abaxially with sparse trichomes in the midrib and lateral veins.....3
 - . Leaves slightly to densely tomentose or velutine on the abaxial side and glabrous to glabrescent to slightly tomentose on adaxial side.....11
3. Anthers glabrous or with few trichomes.....4
 - . Anthers sericeous.....15
- 4 - Shrubs to small trees up to 1 m tall; thyrses 1-2 flowered cincinni; peduncles absent; sepals both sides tomentose.....*Byrsonima gardneriana*
 - . Shrubs to trees 0,40–18 m tall, thyrses1-flowered to 1-2 flowered cincinni; peduncles absent or up to 5 mm long; sepals both side glabrous to sericeous to lightly sericeous to tomentose or abaxial tomentose to lightly sericeous and adaxial side glabrous to glabrescent5
5. Petiole developed, bigger than 6 mm long; drupe 8–9 mm diam.....6

- Petiole absent or underdeveloped up to 5,5 mm long; drupe up to 6 mm diam.8
- 6. Fleshy sepals accrescent in fruits; peduncles absent; leaves obovates, rarely elliptical
.....*B. bahiana*
- Sepals not fleshy and not accrescent in fruits; peduncles 0–5 mm long; leaves elliptical to lanceolates.....7
- 7. All petals white to pink becoming red in age, claw of the posterior petal yellow, stipules ca. 1,6 mm; connectives surpassing the anther sacs in 0.1–1 mm.....*B. ligustrifolia*
- All petals white to pink becoming pink in age; stipules ca. 2.8 mm; connectives not surpassing the anther sacs.....*B. perseifolia*
- 8. Connectives surpassing the anther sacs longer than 0.3 mm; sepals on both sides slightly sericeous or abaxial sericeous to slightly sericeous and adaxial side glabrous.....9
- Connectives not surpassing the anther sacs or surpassing slightly up to 0.2 mm; sepals both side glabrous.....10
- 9. Trees 3–6 m tall; leaves elliptic to obovate, base attenuate to cuneate; petiole 2–5 mm long.....*B. spinensis*
- Shrubs to trees 08–8 m tall; leaves oblong, less often ovate to obovate, base subcordate to cordate; petioles absent or to 0.4 mm long.....*B. umbellata*
- 10. Shrubs ca. 40 cm tall; leaves apex rounded to subemarginate; peduncles 0–1.2 mm long.....15. *B. rigida*
- Shrubs 0.7–3 m tall; leaves apex rounded to cuspidate to apiculate; peduncles absent..... *B. triopterifolia*
- 11. Leaves 1.3–7.8 cm long; drupes up to 12 mm wide.12

- Leaves 5.8–17 cm; drupes bigger than 12.5 mm wide.14
- 12. Drupes 7–12 mm; stipules ca. 1.7 mm long.....*B. blanchetiana*
- Drupes 1.3–6.3 mm; stipules 2–4 mm long.....13
- 13. Shrubs 0.9–1.2 m tall; leaves elliptic, base attenuate.....*B. bumeliifolia*
- Shrubs to small trees 0.5–4 m tall; leaves widely elliptic to ovate to oblong, base cuneate to obtuse to subcordate.....*B. correifolia*
- 14. Trees ca. 6 m tall; main axis of inflorescence 6.8–9 cm long; drupe ca. 13 mm wid.....*B. fonsecae*
- Shrubs 1–2 m tall; main axis of inflorescence 13.3–21.5 cm long; drupe ca. 17 mm width*B. macrophylla*
- 15. Leaves obovate to widely elliptic to oblong, base rounded, truncate, cuneate, or cordate; petioles absent.....*B. coccolobifolia*
- Leaves elliptical to obovate, base attenuate; petiole 0.8–5.3 mm.....16
- 16. Small trees 3–5 m tall; petioles 4.4–5.3 mm long; main axis of inflorescence 7.9–9.4 cm long.....*B. nitidifolia*
- Shrubs 1–2 m tall; petioles 0.8–2 mm long; main axis of inflorescence 5.8–7 cm long.....*B. vacciniifolia*
- 17. Shrubs to subshrubs ca. 0.3–0.4 m tall; main axis of inflorescence ca. 2.5–5.4 cm long.....18
- Shrubs to small trees 1–4 m; main axis of inflorescence 5.5–11.2 cm long.....19
- 18. Stipules ca. 3 mm; petiole ca. 4 mm*B. brachybotrya*
- Stipules ca. 1.7 mm; petiole 0.7–2 mm*B. cipoensis*

19. Leaves on both sides slightly tomentose when young and glabrous to glabrescent when adult, margins revolute.....*B. morii*

-. Leaves with abaxial side densely tomentose, adaxial side glabrescent with trichomes in midrib when young and when adult, margins slightly revolute.....*B. variabilis*

1. *Byrsonima bahiana* W.R.Anderson (1982: 110). Figure 4A.

Trees, 10–12 m tall. *Stipules* ca. 2.8×1.5 mm, free, triangular. *Leaf blades* $6.7\text{--}15.5 \times 3.2\text{--}4.8$ cm, obovate, rarely elliptic, base attenuate, margins flat to slightly revolute, apex rounded to obtuse to acute to submarginate, both sides glabrous, midrib prominulous on both sides and the reddish color on the leaves margins and midrib, laterals veins impressed on both sides and number of ca. 10; petioles $7\text{--}26 \times 1,2$ mm, glabrous. *Thyrse*s 1-flowered cincinnus with ca. 16 flowers, main axis 6–8,8 cm long, glabrescent; bracts ca. 1.7×0.7 mm, triangular, abaxial side glabrous, adaxial side glabrescent; peduncles absent; bracteoles ca. 1.2×1 mm, triangular; pedicels ca. 13×1.3 mm, glabrous; *Flowers* not seen [according to Anderson (1981) the sepals ca. 2.5×3 mm, both sides glabrous except for tiny hairs on the margin, margin revolute at anthesis, rounded, accrescent fleshy sepals in fruits; glands ca. 2.5–3 mm long; all petals white, often tinged with pink, with reddish claw. *Anthers* glabrous; not surpassing or surpassing slightly the anther sacs (up to 0.1 mm in length); filaments 2–3 mm long, sericeous at base; *Ovary* glabrous]. *Drupes* ca. 8.2×8.8 mm, glabrous, verrucous, globose with accrescent fleshy sepals.

Specimens examined:—BRAZIL. Bahia: Morro do Chapéu, Fazenda Ouro Branco, $11^{\circ}22'36''\text{S}$, $41^{\circ}15'1''\text{W}$, 1159 m, fr., 13 October 2006, *E. Melo* 4525 (CEPEC, HUEFS);

Serra Pé do Morro. 11°35'27"S, 41°12'24"W, 1293 m, 29 June 1996, st., PCD 3225, *H.P. Bautista s.n.* (ALCB 36262, HUEFS 61161).

Additional specimen examined:—BRAZIL. Espírito Santo. Conceição da Barra: Itaúnas, Parque Estadual de Itaúnas, Fazenda Jequitaiá, 1 May 2010, fr., *A.G. Oliveira 792* (VIES!).

Notes:—*Byrsonima bahiana* is endemic of Brazil. Occurs in the states of Bahia, Espírito Santo, Sergipe and Alagoas, within the domain of the Atlantic Forest (Francener 2020). According to the national flora center (CNCFlora 2021), the species is considered Near Threatened (NT) according to the IUCN (2012) conservation criteria. *Byrsonima bahiana* has accrescent fleshy sepals on the drupes, blades with midrib and margins reddish and the sepals on both sides are glabrous except for tiny hairs on the margin. It resembles *B. morii* but the last has posterior petal yellow and sepals not accrescent in fruits.

2. *Byrsonima blanchetiana* Miquel (1849: 799). Figure 2A.

Shrubs, 1.2–2 m tall. *Stipules* ca. 1.7 × 0.8 mm, slightly connate, triangular. *Leaf blades* 1.8–3.2 × 0.8–1.3 cm, elliptic, base attenuate, margins flat to slightly revolute, apex rounded to acute, abaxial side densely tomentose, adaxial side glabrescent to slightly tomentose, midrib prominulous on both sides, lateral veins impressed on both sides and number of 6; petioles 1–3.2 × 0.7–0.8 mm, tomentose. *Thyrse*s 1-flowered cincinnus with ca. 15 flowers, main axis 3.2–4.6 cm long, densely tomentose; bracts 1.6–2 × 0.6–1.3 mm, triangular to lanceolate, abaxial side tomentose, adaxial side glabrous to glabrescent; peduncles absent; bracteoles ca. 1.3 × 0.5 mm, triangular to lanceolate; pedicels ca. 4.6 × 0.8 mm, tomentose; sepals ca. 2.3 × 1.7 mm, abaxial side tomentose, adaxial side glabrescent, revolute on apex, ovate, not accrescent in fruits; glands ca. ca. 2.6 × 1.4 mm; all petals white to pink, lateral petals blade

ca. 3.5×3.7 mm, claw ca. 2.7×0.6 mm; posterior petal blade ca. 2.7×3.6 mm, claw ca. 3.3×0.8 mm. *Stamens* free at base; anthers sericeous to glabrous with few trichomes at the top; connectives $1.8\text{--}2.2 \times 0.4\text{--}0.6$ mm, surpassing the anther sacs $0.5\text{--}0.8$ mm; filaments ca. 2.2×0.6 mm, sericeous at base. *Ovary* ca. 1.3×1 mm, glabrous; styles ca. 2.8×0.3 mm. *Drupes* not seen [according to Rolim (2004), 7–12 mm diam., glabrous, globose].

Specimens examined:—BRAZIL. Bahia: Morro do Chapéu, $11^{\circ}49'53''\text{S}$, $41^{\circ}33'06''\text{W}$, 947 m, 10 November 2017, past fl., *L.L. Alves 226* (HUFSJ! HUEFS! ESAL!); Fazenda Guariba, Bacia do Salitre, $11^{\circ}26'14''\text{S}$, $41^{\circ}11'38''\text{W}$, 390 m, 12 October 2007, bud, *E. Melo 5221* (HUEFS! HTSA); estrada do lado da Cachoeira do Ferro Doido, $11^{\circ}36'68''\text{S}$, $41^{\circ}00'25''\text{W}$, 910 m, 9 November 2017, fl., *L.L. Alves 222* (HUFSJ! HUEFS! ESAL!). Municipality unknown, Morro do Chapéu, BA 052, lado esquerdo, a 22 Km da cidade, $11^{\circ}29'25''\text{S}$, $41^{\circ}20'17''\text{W}$, 891 m, 19 January 2009, bud, *F.S.Gomes 203* (ALCB!).

Notes:—*Byrsonima blanchetiana* is endemic to Brazil. Occurs in the states of Bahia, Maranhão and Piauí in the domain of the Cerrado and Caatinga (Francener 2020). According to the national flora center (CNCFlora 2020), it is scored as Least Concern (LC) according to IUCN conservation criteria (IUCN 2012).

It is characterized by small, elliptical leaves, densely tomentose abaxial side, anthers sericeous to glabrous with few trichomes at the top. *Byrsonima blanchetiana* resembles *B. correifolia* but the latter presents larger, widely elliptical leaves, obovate to oblong with revolute margin, bearing long stipitate hairs on the abaxial side, and smaller fruits (up to 6.3 cm in diam.).

3. *Byrsonima brachybotrya* Niedenzu (1901: 10). Figure 2C.

Shrubs to subshrubs, ca. 0.3 m tall. *Stipules* ca. 3×1 mm, free, triangular. *Leaf blades* 2.6–7.2 \times 0.8–2 cm, elliptic to narrowly elliptic, base attenuate, margins slightly revolute, apex acute to rounded, abaxial side glabrous to glabrescent, adaxial side glabrous, midrib and lateral veins prominulous on abaxial side, laterals veins impressed on adaxial side and number of 5; petioles ca. 4×1.5 mm, glabrous to glabrescent. *Thyraxes* 1-flowered cincinnus, ca. 20 flowers congested at the apex of the axis, main axis ca. 5.3 cm long, tomentose; bracts ca. 4.2×1.5 mm, lanceolate, abaxial side tomentose, adaxial side glabrescent; peduncles absent; bracteoles ca. 2.5×1.2 mm, lanceolate; pedicels ca. 9.5×1.2 mm, tomentose; sepals ca. 2.3×2 mm, abaxial side slightly tomentose, adaxial side glabrescent, margin flat at anthesis, ovate, not accrescent in fruits; glands ca. 1.8×1 mm. *Flowers* not seen [according to Niedenzu (1928), lateral petals white with claw becoming pink in age, posterior petal yellow, becoming red with age. *Anthers* glabrous, connectives not surpassing the anther sacs. *Ovary* glabrous]. *Drupes* not seen [according to Niedenzu (1928), ovoid, glabrous].

Specimen examined:—BRAZIL: Minas Gerais, Ouro Branco, Serra de Ouro Branco, 20°29'08"S, 43°42'40"W, 1587 m, 23 September 2002, fl., *C.C. de Paula 343* (VIC).

Notes:—*Byrsonima brachybotrya* is endemic of Brazil. It occurs only in the states of São Paulo and Paraná in the domain of the cerrado (Francener 2020). Although until the moment there are no records for the state of Minas Gerais, this specimen has the typical characteristics of the species and was collected in the Serra de Ouro Branco, the beginning of the south portion of the Espinhaço Range. *Byrsonima bachybotrya*, according to the National Flora Conservation Center (CNCFlora 2021), is considered as near threatened (NT) according to the IUCN (2012) conservation criteria. It is characterized by lateral petals pink to white and posterior petals yellow, leaves slightly tomentose when young and glabrous with age, margins

slightly revolute, flowers congested at the apex of the inflorescence. It resembles *B. blanchetiana*, but the latter presents the abaxial side of the leaves densely tomentose and the flowers arranged along the main axis. Focusing only on the umbel-like flower arrangement it resembles *B. umbellata*, but the latter presents all petals pink to white, larger leaves (up to 13.5×7.8 cm) and is a tree or subshrub.

4. *Byrsonima bumeliifolia* A.Jussieu (1832: 79). Figure 4B.

Habit not recorded [according to Jussieu (1833), shrub, 0.9–1.2 m tall]. *Stipules* ca. 4×2.5 mm, free, triangular. *Leaf blades* $3.3\text{--}7.8 \times 0.8\text{--}3.8$ cm, elliptic, base attenuate, margins slightly revolute, apex rounded to acuminate to subemarginate, abaxial side densely tomentose to velutine, adaxial side glabrescent, with characteristic persistent and twisted trichomes on both sides, midrib prominulous on both sides, lateral veins impressed on both sides and number of 7; petioles $4.2\text{--}6 \times 1.4\text{--}1.5$ mm, tomentose. *Thyrse*s 1-flowered cincinnus with ca. 25 flowers, main axis ca. 9.5 cm long, densely tomentose; bracts ca. 3×0.8 mm, lanceolate, abaxial side tomentose; peduncles absent; bracteoles ca. 2.2×0.6 mm, lanceolate; pedicels ca. 12×1 mm, densely tomentose. *Flowers* not seen [according to Jussieu (1833), sepals ca. 3.3 mm, abaxial side tomentose, adaxial side glabrous, revolute on apex, ovate, not accrescent in fruits; all petals white to pink. *Anthers* glabrous; *Ovary* glabrous]. *Drupes* not seen [according to Niedenzu (1928), 1.3 mm in diam., ovoid].

Specimen examined:—BRAZIL. Minas Gerais: Milho Verde, Diamantina, bud, fl., *Saint-Hilaire*, A. de 1816 (P).

Notes:—*Byrsonima bumeliifolia* is endemic of Brazil. It occurs in the state of Minas Gerais and Bahia in the Cerrado domain (Francener 2020). The abaxial side of the leaves is densely

tomentose, with characteristic persistent and twisted trichomes. In the original description, Jussieu (1832) described it with anthers and ovaries glabrous. Later, Niedenzu (1928) described it with anthers and ovaries sericeous. *Byrsonima bumeliifolia* resembles *B. variabilis*, based on the description of Niendenzu, they could be differentiated by indumentum of the anthers and ovaries. In this paper, we chose to accept the original description of Jussieu (1832), with anthers and glabrous ovaries. Anderson (1982) differs *B. bumeliifolia* from *B. morii* based on the abaxial side of the leaves with very dense, strongly twisted and persistent trichomes, as in *B. variabilis*, and considers that *B. variabilis* and *B. B. bumeliifolia* may be conspecific; nevertheless, according to the original description *B. bumeliifolia* would differ from *B. variabilis* by the posterior yellow petal in the latter.

5. *Byrsonima cipoensis* Mamede (1980: 42). Figure 2B.

Shrubs to subshrubs, 0.3–0.4 m tall. *Stipules* ca. 1.7×1 mm, free to slightly connate, triangular. *Leaf blades* $1.7\text{--}4.5 \times 0.5\text{--}1.5$ cm, elliptic to lanceolate, base attenuate to cuneate, margins flat, apex acute to acuminate, both sides glabrous to glabrescent with trichomes on midrib, midrib prominulous on both sides, laterals veins impressed on both sides and number of 5; petioles $0.7\text{--}2 \times 1.4\text{--}1.7$ mm, glabrescent to tomentose. *Thyraxes* 1-flowered cincinnus with 6–18 flowers congested at the apex of the axis, main axis 2.5–5.4 cm long, densely tomentose; bracts $3.5\text{--}4.6 \times 0.4\text{--}1$ mm, lanceolate, abaxial side tomentose, adaxial side glabrous; peduncles absent; bracteoles $1.4\text{--}3.3 \times 0.4\text{--}0.6$ mm, lanceolate; pedicels ca. 11×1 mm, densely tomentose; sepals ca. 2.2×2.5 mm, abaxial side tomentose, adaxial side glabrous, slightly revolute on apex, triangular, not accrescent in fruits; glands ca. 1.7×0.7 mm; lateral petals white becoming pink with age, blade ca. 3×4.7 mm, claw ca. 2.8×0.5 mm; posterior petal yellow, blade ca. 2.7×3.7 mm, claw ca. 2.5×0.7 mm. *Stamens* free to

slightly connate at base; anthers glabrous; connectives ca. 1×0.8 mm, not surpassing or surpassing slightly the anther sacs (these up to 0.2 mm in length); filaments ca. 1.6×0.4 mm, sericeous at base. *Ovary* ca. 1.2×0.8 mm, glabrous; styles ca. 2.8×0.2 mm. *Drapes* not seen [according to Mamede (1980), 4–5.5 mm in diam., glabrous, globose].

Specimens examined:—BRAZIL. Minas Gerais: Santana do Riacho: MG-010, sentido Santana do Riacho, $19^{\circ}17'S$, $43^{\circ}33'W$, 1230 m, 14 October 2011, bud, fl., *C. Silva 559* (HUEFS!); MG-101, Km 129, $19^{\circ}17'19'S$, $43^{\circ}33'50'W$, 1230 m, 12 December 2013, bud, fl., *A. Rapini 1600* (HUEFS!).

Notes:—*Byrsonima cipoensis* is endemic of Brazil. Occurs in the state of Minas Gerais in the Cerrado domain (Francener 2020). According to the National Flora Conservation Center (CNCFlora 2021), *B. cipoensis* is considered as Endangered (EN) according to IUCN conservation criteria (IUCN 2012). It is characterized by small, lanceolate, or elliptical leaves, posterior petal yellow and lateral petals white to pink and small inflorescence, concentrated at the apex. *Byrsonima cipoensis* resembles *B. brachybotrya* and *B. microphylla*, the latter presents all petals white to pink, abaxial side of the leaves densely tomentose and leaves ovate to rounded with margins revolute (Mamede 1980), while *B. brachybotrya* presents very subtle differences to *B. cipoensis*. *Byrsonima brachybotrya* has elliptic to narrowly elliptic leaves with an acute to rounded apex and longer petioles (up to 4 mm) while in *B. cipoensis* the leaves are opposite and sometimes spiral, elliptical to lanceolate with acute or acuminate apex, and petiole are up to 2 mm long.

6. *Byrsonima coccolobifolia* Kunth (1822: 148). Figure 2D.

Trees to shrubs, 0.3–2 m tall. *Stipules* ca. 1.2×2.2 mm, connate, triangular. *Leaf blades* $3.2\text{--}9.3 \times 2.5\text{--}6$ cm, obovate to widely elliptic to obovate to oblong, base rounded, truncate, cuneate, or cordate, margins flat, apex rounded to emarginate, both sides glabrous, midrib and laterals veins prominulous on both sides and number of 5–7, midrib and principal laterals veins pink; petioles absent. *Thyrse*s 1-flowered cincinnus with ca. 16–23 flowers, main axis ca. 6.4–12.6 cm long, sericeous to velutine; bracts $2\text{--}2.6 \times 0.8\text{--}1.3$ mm, triangular to lanceolate, abaxial side tomentose, adaxial side glabrous to glabrescent; peduncles absent; bracteoles ca. 2×1.3 mm, triangular; pedicels $1.8\text{--}6.5 \times 0.6\text{--}1$ mm, velutine to tomentose; sepals $2.8\text{--}3.6 \times 0.6\text{--}1$ mm, abaxial side tomentose, adaxial side glabrous, margin revolute at anthesis, ovate, not accrescent in fruits; glands ca. $2.3\text{--}3.3 \times 1\text{--}2.3$ mm; all petals white to pink; lateral petals blade $3.0\text{--}4.3 \times 4.5\text{--}5$ mm, claw $2.3\text{--}2.7 \times 0.6$ mm; posterior petal blade $2.4\text{--}2.8 \times 3.8\text{--}4$ mm, claw ca. 3.8×0.7 mm. *Stamens* free at base; anthers sericeous; connectives ca. 2.3×0.6 mm, surpassing the anther sacs in 0.8–1 mm; filaments $2\text{--}3 \times 0.4\text{--}0.8$ mm, sericeous at base. *Ovary* $1.2\text{--}1.6 \times 1.3$ mm, glabrous; styles ca. 4×0.4 mm. *Drupes* ca. 8.8×7 mm, glabrous, verrucous, globose.

Specimens examined:—BRAZIL: Bahia: Abaíra, Chapada Diamantina, estrada de Abaíra para a Barra da Estiva, $13^{\circ}15'51''\text{S}$, $41^{\circ}26'37''\text{W}$, 1099 m, 10 October 2009, bud, *M.L. Guedes 16661* (ALCB!). Caetité, 6 Km ao sul de Caetité, na estrada para Brejinho das Ametistas, $14^{\circ}7'47''\text{S}$, $42^{\circ}30'15''\text{W}$, 10 January 2006, bud, fl., *T.S. Nunes 1596* (HUEFS! P); Caminho para Licínio de Almeida, $14^{\circ}05'16''\text{S}$, $42^{\circ}30'19''\text{W}$, 1080 m, 10 February 1997, fr., PCD 5359, *B. Stannard s.n.* (ALCB! 36249, HURB 12903, CEPEC 96992, SPF 130042, HUEFS 29268); estrada para Licínio de Almeida, 9,5 Km após a localidade de Brejinho das Ametistas, 16 December 2009, fl., *L.J. Alves s.n.* (HUEFS 173256!). Ibicoara, estrada Vicinal próximo à

divisa com Mucugê, 13°15'20"S, 41°25'39"W, 1165 m, 24 October 2013, bud, *E. Melo 12262* (HUEFS!). Rio de Contas, Fazendola, 16 November 1996, bud, fl., PCD 4331, *H.P. Bautista s.n* (ALCB 36277! SPF 130048, HUEFS 28748, CEPEC 79185).

Notes:—*Byrsonima coccolobifolia* occurs from Cuba towards South America up to Paraguay, passing through Colombia, Peru, Venezuela, and Brazil (IPNI 2021). According to the National Flora Conservation Center (CNCFlora 2021), *B. coccolobifolia* is scored as Least Concern (LC) according to IUCN conservation criteria (IUCN 2012). In Brazil is widely distributed in all regions, in the domains of Atlantic Forest, Amazonia, and Cerrado (Francener 2020). It is characterized by its leaves widely elliptic to ovate, base rounded to truncate to cuneate to cordate, margins flat, apex rounded to emarginate, usually midrib and principal laterals veins pink, petiole absent. *Byrsonima coccolobifolia* resembles *B. morii*, but the latter presents the posterior petal yellow and laterals petals white to pink, margin of leaves revolute and visible petioles (up to 8.3 mm long).

7. *Byrsonima correifolia* A.Jussieu (1832: 78). Figure 2E.

Shrubs to small trees, 0.5–4 m tall. *Stipules* 2–3.6 × 1.2–2.4 mm, slightly to entirely connate, triangular. *Leaf blades* 1.3–4.2 × 1.7–2.4 cm, widely elliptic to ovate to oblong, base cuneate to obtuse to subcordate, margins revolute, apex rounded to acuminate to obtuse, abaxial side densely tomentose to velutine, adaxial side glabrescent, midrib prominulous on both sides, laterals veins impressed on both sides and number of 5-7; petioles 2–2.5 × 2–1.8 mm, densely tomentose. *Thyrse*s 1-flowered cincinnus with 16–24 flowers, main axis 4.2–7.8 cm long, densely tomentose; bracts 1.8–2 × 1.3–1.7 mm, triangular, abaxial side tomentose, adaxial side glabrous; peduncles absent; bracteoles 1.3–1.6 × 1–1.2 mm, triangular; pedicels 9–11 ×

0.7–0.8 mm, densely tomentose; sepals $2.3\text{--}3 \times 1.8\text{--}2$ mm, abaxial side tomentose, adaxial side glabrous, slightly revolute on apex, ovate, not accrescent in fruits; glands ca. $1.8\text{--}2 \times 0.7\text{--}1.4$ mm; all petals white to pink, lateral petals blade $3.3\text{--}3.7 \times 3.9\text{--}4.7$ mm, claw $2.5\text{--}2.8 \times 0.6\text{--}0.8$ mm; posterior petal blade $2.6\text{--}3 \times 2.3\text{--}5.2$ mm, claw $2.9\text{--}3.2 \times 1\text{--}1.3$ mm. *Stamens* free at base; anthers sericeous; connectives $2.4\text{--}2.6 \times 0.6$ mm, surpassing the anther sacs in $1\text{--}1.6$ mm; filaments $2.2\text{--}2.6 \times 0.6\text{--}0.7$ mm, sericeous at base. *Ovary* $1.3\text{--}1.5 \times 1$ mm, glabrous; styles ca. 3.6×0.4 mm. *Drupes* $5.6\text{--}6 \times 5.3\text{--}6.3$ mm, glabrous, verrucous, globose to ovoid.

Specimens examined:—BRAZIL. Bahia: Andaraí, Chapada Diamantina, $12^{\circ}54'S$, $41^{\circ}14'W$, 30 April 2001, fl., fr., *L.J. Alves 3* (ALCB! HUESB); Chapada Diamantina, subida para o Pati, $12^{\circ}48'23''S$, $41^{\circ}20'46''W$, 10 May 2003, fl., *M.L. Guedes 10280* (ALCB! CEPEC). Brotas de Macaúbas, estrada para pé do morro, $12^{\circ}2'15''S$, $42^{\circ}40'50''W$, 2 June 2007, fl., *A.A. Conceição 2117* (HUEFS! SP). Caetité, 3 Km do Brejinho das Ametistas, na estrada para Caetité, $14^{\circ}15'34''S$, $42^{\circ}31'W$, 1200 m, 29 April 2001, bud, fl., *C. Correia 69* (HUEFS! CEPEC, ALCB); Beira de estrada entre as cidades de Porteirinha e Caetité, $14^{\circ}05'24''S$, $42^{\circ}30'89''W$, 1056 m, 5 November 2017, *L.L. Alves 208* (HUFSSJ!); Serra Geral, $14^{\circ}04'S$, $42^{\circ}28'W$, 20 December 2007, bud, *M.L. Guedes 14374* (ALCB! UESC); Serra Geral, ca. 3 Km da cidade. Estrada para Brejinho das Ametistas, $14^{\circ}05'19''S$, $42^{\circ}30'19''W$, 28 April 2003, fl., fr., *R.B. Botelho 5* (ALCB! CEPEC); Ibicoara, Chapada Diamantina, Cascavel, 3 April 2011, bud, fl., *H.A. Ogasawara 102* (ALCB!). Jussiape, loteamento à direita da estrada para Jussiape. 2 Km da entrada, $13^{\circ}35'80''S$, $41^{\circ}48'05''W$, 1097 m, 8 November 2017, *L.L. Alves 214* (HUFSSJ!). Mucugê, $12^{\circ}59'12''S$, $41^{\circ}20'39''W$, 1164 m, 13 July 1996, fl., CPD 3568, *H.P. Bautista s.n.* (ALCB 36305! CEPEC 79169, SPF 121647, HUEFS 25624); Chapada Diamantina, $13^{\circ}00'S$, $41^{\circ}22'$, 984 m, 31 July 2013, fr., *M.L. Guedes s.n.* (ALCB 39496!); Chapada Diamantina, Caminho para Abaíra, $13^{\circ}33'S$, $41^{\circ}48'W$, 8 July 2012, fr., *M.L. Guedes 20110* (ALCB!). Palmeiras, Chapada Diamantina, ca. 33 Km de Seabra. Estrada para o morro

do Camelo, 12°25'27"S, 41°28'41"W, 757 m, 1 May 2003, bud, *M.L. Guedes 10376* (ALCB! CEPEC, SPF). Piatã, Chapada Diamantina, Caminho para os três morros, 13°04'25"S, 41°47'51"W, 1304 m, 2 May 2009, *M.L. Guedes 15168* (ALCB! US); Estrada de terra secundária em Piatã, 13°03'12"S, 41°57'19"W, 1415 m, 8 November 2017, *L.L. Alves 219* (HUFSJ!); Estrada para o povoado de Rio de Contas, 13°07'16"S, 41°41'50"W, 1258 m, 19 April 2014, bud, fl., *E. Melo 12650* (HUEFS!). Rio de Contas, Chapada Diamantina, 13°59'S, 41°60'W, 4 February 2017, bud, fl., *M.L. Guedes 25404* (ALCB!); Chapada Diamantina, caminho para o Rio da Água Suja, 13°28'54"S, 41°46'41"W, 680 m, 12 February 2010, *N. Roque 2666* (ALCB! US).

Notes:—*Byrsonima correifolia* is endemic to Brazil. It occurs in the states of Minas Gerais, Bahia, Maranhão, Piauí, and Tocantins in the domains of Cerrado and Caatinga (Francener 2020). It is characterized by the abaxial side of the leaves densely tomentose to velutine, revolute, widely elliptical, oblong to ovate, with the connective surpassing the anther sacs in (1–1.6 mm). *Byrsonima. correifolia* resembles *B. blanchetina*, which can be verified in the notes of the latter species.

8. *Byrsonima fonsecae* W.R.Anderson (1982: 105) Figure 4C.

Trees ca. 6 m tall. *Stipules* ca. 4 × 2 mm, slightly connate to connate, triangular. *Leaf blades* 5.8–15 × 2.3–7.8 cm, obovate to elliptic, base cuneate, margins slightly revolute, apex rounded to acuminate, abaxial side slightly tomentose to tomentose, adaxial side glabrescent, midrib and laterals veins prominulous on abaxial side and impressed on adaxial side and number of 8-9. *Thyraxes* 1-flowered cincinnus, with 25–30 flowers, main axis 6.8–9 cm long, tomentose. *Flowers* not seen [according Anderson (1982), bracts 1.5–2.5 wide, ovate to

lanceolate, abaxial side tomentose, adaxial side glabrous; peduncles 1.5–10 mm long; bracteoles like the bracts or somewhat smaller; pedicels 7–8.5 mm long, tomentose; sepals 1.5–2 × 2–2.5 mm, both sides tomentose, margin revolute at anthesis, obtuse to rounded, somewhat accrescent in fruits; glands 2–3 mm long, all petals white, claw pink to red, claw posterior petal yellow, whole petal becoming red in age; lateral petals blade 4.5–5.5 × 6–6.7 mm, claw 3–3.5 mm long; posterior petal blade 3.5–4.5 × 4 mm, claw ca. 3 mm long. Anthers glabrous; connectives 1.4–2.7 × 0.5–0.8 mm, surpassing the anther sacs in 0.3–0.9 mm; filaments 2–2.7 mm long, sericeous at base. *Ovary* ca. 1.5 high, glabrous, styles 3–3.5 mm long]. *Drupes* ca. 13 x 13 mm, glabrous, verrucous, globose.

Specimens examined:—BRAZIL: Minas Gerais: Municipality unknown, Serra do Cipó, 1225 m, 18 February 1972, fl., fr., *W.R. Anderson 36183* (NY). Santana do Riacho, Fazenda Bela Vista, 25 May 2008, st., *A. Lutterbach s.n.* (BHZB 6568, HUEFS 210597); Serra do Cipó, Rodovia Belo-Horizonte, Conceição do Mato Dentro, cerca de 400 m antes da bifurcação entre Morro do Pilar e Conceição do Mato Dentro. Primeiro capão depois da rodovia, 20 November 1993, *M.T.V.A. Campos s.n.* (SPF 152760).

Notes:—*Byrsonima fonsecae* is endemic of Brazil. It occurs in the state of Minas Gerais, in Cerrado domain (Francener 2020). According to the National Flora Conservation Center (CNCFlora 2021), *B. fonsecae* is considered Critically Endangered (CR) according to IUCN conservation criteria (IUCN 2012). It is characterized by its arboreal size, pedunculate, large leaves (up to 25.8 cm) and large petiole (up to 16 mm). *B. fonsecae* resembles *B. perseifolia* and *B. gardneriana* but the latter presents smaller size (up to 1 m), smaller leaves (up to 6.8 cm), smaller petiole (up to 5.4) absent peduncles. *Byrsonima perseifolia* presents glabrous leaves, smaller peduncles (up to 1.6 mm) and smaller fruit (up to 9 mm in diam).

9. *Byrsonima gardneriana* A.Jussieu (1843:296) Figure 4D.

Small trees to shrubs, 0.6–1 m tall. *Stipules* 1.6–2.2 × 0.6–1.6 mm, free, triangular. *Leaf blades* 2–6.8 × 1.2–4 cm, obovate to widely elliptic to elliptic to oblong, base truncate to cuneate to attenuate, margins flat to revolute, apex rounded to emarginate to subemarginate, both sides glabrous to glabrescent with few trichomes on midrib, midrib prominulous on both sides, laterals veins impressed on abaxial side and prominulous on adaxial side and number of 6-8; petioles 1–5.4 mm. *Thyraxes* 1-2 flowered cincinni, with 14–27 flowers, main axis 5.6–7 cm long, slightly sericeous to tomentose; bracts 1.6–2.4 × 0.7–1.4 mm, triangular to lanceolate, abaxial side tomentose, adaxial side glabrous to glabrescent; peduncles absent; bracteoles 1–1.6 × 0.6–1.2 mm, triangular, not accrescent in fruits; pedicels 3–8.5 × 0.7–1 mm, densely tomentose; sepals 2.4–3.6 × 1.6–2 mm, both sides tomentose, margin revolute at anthesis, ovate; glands ca. 2 × 1 mm. All petals white to pink; lateral petals blade 3.3–4.3 × 4–6.8 mm, claw 2.2–3.4 × 0.4–0.6 mm; posterior petal blade 2.4–3.4 × 4–6.8 mm, claw 3.2–4 × 0.6–1 mm. *Stamens* free at base; anthers glabrous; connectives 1.4–2.7 × 0.5–0.8 mm, surpassing the anther sacs in 0.7–1.1 mm; filaments 2 × 0.6 mm, sericeous at base. *Ovary* ca. 1.5 × 1 mm, glabrous; styles 3–3.4 × 0.2–0.4 mm. *Drupes* ca. 7.5–11.5 × 6–10.5 mm, glabrous, verrucous, globose.

Specimens examined:—BRAZIL: Bahia: Licínio de Almeida, estrada Licínio de Almeida para Caetité, Serra do Jambreiro, 14°35'23"S, 14°35'23"W, 788 m, 04 November 2006, bud, fr., *P.D. Carvalho 379* (HUEFS! SP). Morro do Chapéu, 4 a 8 km de Morro do Chapéu para Utinga, 11°60'S, 41°2'W, 25 March 2016, bud, *M.L. Guedes 24544* (ALCB! HUESB); Fazenda Guariba, 11°26'18"S, 41°11'38"W, 07 February 2007, bud, fl., *D. Rocha 436* (HUEFS! CEPEC). Palmeiras, Parque Nacional Chapada Diamantina, Morro dos Ventos, 12°32'25"S, 41°29'49"W, 950 m, 30 July 2011, fr., *G. Almeida-Silva 44* (HUEFS!). Minas

Gerais: Santana do Riacho, Serra do Cipó, 19°16'60"S, 43°36'02"W, 1033 m, 21 October 2017, bud, fl., *L.L. Alves 181* (HUFSJ! HUEFS! ESAL!).

Notes:—*Byrsonima gardneriana* is endemic to Brazil. It occurs in the states of Espírito Santo, Minas Gerais, Amapá, Pará and northeast region in the domain of the Amazon, Caatinga, Cerrado and Atlantic Forest (Francener 2020). It is characterized by habit trees to shrubs, ca. 1 m tall, peduncles absent, and connective surpassing the anther sacs by up to 0.7 mm long. *Byrsonima gardneriana* resembles *B. vacciniifolia* and *B. morii*, but the latter presents the posterior petal yellow and laterals petals white to pink, peduncles 0–4.8 mm and connective surpassing the anther sacs up to 0.06 mm. *Byrsonima vacciniifolia* presents a bigger size (up to 2 m, but it can reach bigger heights depending on the region), anther sericeous and elliptic to obovate leaves.

10. *Byrsonima ligustrifolia* A.Jussieu (1832: 82) Figure 3A.

Trees, 3–18 m tall. *Stipules* ca. 1.6×0.8 mm, slightly connate, triangular. *Leaf blades* 2.8–11 \times 1.2–3.8 cm, elliptic to lanceolate, base attenuate, margins slightly revolute, apex acute to acuminate, abaxial side glabrous to glabrescent with few trichomes on midrib, adaxial side glabrous, midrib and laterals veins prominulous on abaxial side and impressed on adaxial side and number of 8-9; petioles $8\text{--}9.2 \times 1.5\text{--}2$ mm. *Thyraxes* 1-flowered cincinnus, with 22–24 flowers, main axis 0.5–11 cm long, slightly sericeous to tomentose. *Flowers* not seen [according to Rolim (2004), bracts $1\text{--}5 \times 1.5\text{--}2$ mm, triangular to lanceolate to ovate, abaxial side slightly tomentose to slightly sericeous, adaxial side glabrous; peduncles 0–5 mm; bracteoles $2\text{--}2.5 \times 0.5\text{--}1.5$ mm, triangular to lanceolate to ovate; pedicels 0.6–8.5 mm long, slightly sericeous, sericeous, or tomentose; sepals ca. 2.1×1.7 mm, both sides glabrous,

sericeous, or tomentose, margin revolute at anthesis, ovate to triangular, not accrescent in fruit; glands $1.5\text{--}2 \times 0.5\text{--}0.8$ mm; all petals white to pink becoming red in age, claw posterior petal yellow; lateral petals blade ca. 3.6×4.7 mm, claw ca. 1.8×0.6 mm; posterior petal blade $3.1\text{--}4 \times 3.5\text{--}5$ mm, claw ca. 2.1×0.8 mm. *Stamens* free at base; anthers glabrous; connectives $1.5\text{--}2.1 \times 0.8$ mm, surpassing the anther sacs in 0.1–1 mm; filaments $2.2\text{--}2.9 \times 0.5\text{--}0.7$ mm, sericeous at base. *Ovary* $1.5\text{--}1.8 \times 1.2\text{--}1.7$ mm, glabrous; styles 2.1–4.1 mm long]. *Drupes* ca. 8.2×9 mm, glabrous, verrucous, globose.

Specimens examined:—BRAZIL: Minas Gerais: Ouro Branco, Serra de Ouro, 20°28'S, 43°41'W, 1200–1500 m, 12 May 1990, fr., *M.M. Arbo* 3980 (SPF, SP). Unknown municipality, eastern slopes of Pico do Itambé, 1550 m, 12 February 1972, bud, *W.R. Anderson* 35875 (NY, F, UB, IAN); Valley, 5 Km SSE of Pico de Itambé, 1140 m, 14 February 1972, fl., *W.R. Anderson* 36008 (NY, MO, UB, US).

Notes:—*Byrsonima ligustrifolia* is endemic to Brazil. It occurs in the state of Bahia, and the entire southeast and south region of the country (Francener 2020). It is a tree, with leaves elliptical to lanceolate, flowers white to pink, becoming red in age, claw of posterior petal yellow. It resembles *B. brachybotrya*, but the latter is a subshrub, with posterior petal yellow and lateral petals white to pink, and connective not surpassing the anther sacs.

11. *Byrsonima macrophylla* (Persoon 1805: 506) W.R.Anderson (1993: 362). Figure 2F.

Shrubs, 1–2 m tall. *Stipules* $6.5\text{--}6.8 \times 3.8\text{--}4.5$ mm, free to slightly connate, triangular. *Leaf blades* $9.5\text{--}13 \times 4.7\text{--}7.1$ cm, elliptic to obovate, base cuneate to truncate, margins flat to slightly revolute, apex rounded to acuminate, abaxial side tomentose, adaxial side glabrous to glabrescent, midrib prominulous on both sides, lateral veins impress on both sides and

number of 10; petioles ca. 10–15.5 × 3.5 mm, densely tomentose. *Thyraxes* 1-2 flowered cincinni with 30–60 flowers, main axis 13.3–21.5 cm long, densely tomentose; bracts ca. 3.2 × 2.4 mm, lanceolate to triangular, abaxial side tomentose, adaxial side glabrous to glabrescent; peduncles 0–2.4 mm; bracteoles ca. 3 × 1.6 mm, lanceolate to triangular; pedicels ca. 8 × 1.8 mm, densely tomentose; sepals 2.3–3 × 1.7–1.8 mm, abaxial side tomentose, adaxial side glabrous to glabrescent, not revolute on apex, ovate, not accrescent in fruits; glands ca. 2.2 × 2.8 mm; all petals white to pink, the posterior petal with yellow claw, lateral petals blade 3.8–5 × 4.2–5.6 mm, claw 1.5–1.8 × 0.4–0.5 mm; posterior petal blade ca. 2.3 × 3.8 mm, claw 1.7–3 × 0.6–0.7 mm. *Stamens* free at base; anthers sericeous; connectives 1.1–1.6 × 0.5 mm, not surpassing or surpassing slightly the anther sacs (up to 0.3 mm long); filaments ca. 2.4 × 0.6 mm, sericeous at base. *Ovary* ca. 1.2 × 0.7 mm, glabrous; styles 2–2.6 × 0.2–0.3 mm. *Drupes* 16 × 17 mm, glabrous, smooth, globose to ovoid.

Specimens examined:—BRAZIL. Minas Gerais: Diamantina; BR 367 sentido Curvelo, Km 599, após o entroncamento para Conselheiro Mata, lado esquerdo da estrada, 18°16'S, 43°41'W, 1400 m, 12 October 2011, bud, fl., fr., C. Silva 515 (HUEFS!); ca. 7 km de Diamantina para Canto de Magalhães de Minas, 18°10'54"S, 43°33'45"W, 1294 m, 8 January 2003, fl., L.P. de Queiroz 7582 (HUEFS!);

Notes:—*Byrsonima macrophylla* is endemic to Brazil. It occurs in the state of Minas Gerais in the Cerrado and Atlantic forest domains (Francener 2020). According to the national flora center (CNCFlora 2021), *B. macrophylla* is considered Near Threatened (NT) according to the IUCN (2012) conservation criteria. Its large leaves and petioles (up to 13 × 7.1 cm and 15.5 mm respectively), showy fruits (up to 17 mm in diam), and long inflorescence with many flowers (up to 60) characterize the species. *Byrsonima macrophylla* resembles *B. variabilis* but the last presents smaller leaves and petioles (up to 7.7 × 4 cm and 4.6 mm respectively) and smaller fruits (up to 5 mm in diam).

12. *Byrsonima morii* W.R.Anderson (1982: 95). Figure 5A.

Shrubs, 1.2–2 m tall. *Stipules* ca. 1.4×3.5 mm, free to slightly connate, triangular. *Leaf blades* $1.6\text{--}7.2 \times 1.1\text{--}6.3$ cm, oblong to widely elliptic to obovate to circular, base cuneate to attenuate, margins revolute, apex rounded to subemarginate to emarginate, both sides slightly tomentose when young and glabrous to glabrescent when adult, midrib prominulous on both sides, laterals veins impressed on both sides and number of 5-6; petioles $3\text{--}8.3 \times 1.5\text{--}2$ mm, glabrous to lightly tomentose. *Thyraxes* 1-2 flowered cincinni with 16–26 flowers, main axis 6.9–11.2 cm long, slightly sericeous to densely tomentose; bracts $2\text{--}4 \times 0.6\text{--}1.3$ mm, ovate to lanceolate, abaxial side tomentose, adaxial side slightly tomentose to glabrous; peduncles $0\text{--}4.8 \times 1\text{--}1.5$ mm; bracteoles $1.8\text{--}2.3 \times 0.7\text{--}1.3$ mm, triangular to lanceolate; pedicels ca. 9×0.7 mm, densely tomentose; sepals $3\text{--}3.8 \times 2\text{--}3$ mm, abaxial side sericeous to tomentose, adaxial side glabrous, revolute on apex, ovate, not accrescent in fruits; glands ca. 2.2×1 mm; lateral petal white to pink, blade ca. 4.5×5 mm, claw ca. 2.5×0.5 mm; posterior petal yellow becoming red in age, blade $3\text{--}3.6 \times 4.4\text{--}5.6$ mm, claw $2.8\text{--}4.2 \times 0.8\text{--}1$ mm. *Stamens* free at base; anthers glabrous with few trichomes between the anther sacs; connectives $1.5\text{--}1.8 \times 0.6$ mm, not surpassing the anther sacs or surpassing the anther sacs (up to 0.6 mm in length); filaments ca. 3.3×0.7 mm, sericeous at base. *Ovary* $1.4\text{--}1.8 \times 1\text{--}1.3$ mm, glabrous; styles ca. 3.5×0.3 mm. *Drupes* $6\text{--}7.8 \times 5\text{--}7.6$ mm, glabrous, verrucous, globose to ovoid.

Specimens examined:—BRAZIL. Bahia: Lençóis, Serra da Chapadinha. $12^{\circ}27'20''\text{S}$, $41^{\circ}26'120''\text{W}$, 920m, 29 July 1994, fr., PCD 293, *M.L. Guedes s.n.* (ALCB 36196! SP 289088, HUEFS 20769, CEPEC 68470). Morro do Chapéu, ca. de 12km do Morro do Chapéu, no sentido de Tamboril, Serra do Candéal, $11^{\circ}26'42''\text{S}$, $41^{\circ}11'19''\text{W}$, 1063m, 11 March 1996, bud, fl., PCD 2285, *A.M. Giuliatti s.n.* (ALCB 39825! US 3602382, CEPEC 97031). Mucugê, Chapada Diamantina, Arredores da Pousada Alpina, 30 April 2009, fl., *N. Roque 1958*

(ALCB! US, ALCB); Unknown municipality, Área de Manejo sustentável Sempre Viva, 12 October 1998, fr., *D.F. Gomes 3* (ALCB! HUEFS).

Notes:—*Byrsonima morii* is endemic of Brazil. It occurs in the state of Minas Gerais and Bahia within the Cerrado and Caatinga domain (Francener 2020). According to the national flora center (CNCFlora 2021), *B. morii* is considered Near Threatened (NT) according to the IUCN (2012) conservation criteria. Posterior petals yellow and lateral petals white to pink, leaves widely elliptic to oblong to circular with revolute margin characterize the species. *Byrsonima morii* resembles *B. bahiana* and *B. brachybotrya*, but the last is ca. 30 cm tall and leaves elliptic to narrowly elliptic, while *B. bahiana* presents the habit tree up to 12 m and all petals white, often tinged with pink.

13. *Byrsonima nitidifolia* A.Jussieu (1843: 295). Figure 5B.

Small trees, 3–5 m tall. *Stipules* 2.5–3 × 0.8–1 mm, free to slightly connate, triangular. *Leaf blades* 3.8–8 × 1.5–3.8 cm, elliptic, base attenuate, margins flat to slightly revolute, apex acute to acuminate to falcate, both sides glabrous, midrib prominulous on both sides, laterals veins impressed on both sides and number of 7; petioles 4.4–5.3 × 1.3–1.4 mm, glabrous. *Thyrse*s 1-flowered cincinnus with ca. 26 flowers, main axis 7.9–9.4 cm long, tomentose; bracts ca. 2.3 × 0.8 mm, lanceolate, abaxial side slightly tomentose, adaxial side glabrescent; peduncles absent; bracteoles ca. 1.4 × 0.8 mm, ovate; pedicels ca. 6.6 × 1.8 mm, tomentose; sepals ca. 2.8 × 2 mm, both sides slightly tomentose, not revolute on apex, ovate, not accrescent in fruits; glands ca. 2.6 × 1.4 mm; all petals white to pink, lateral petals blade ca. 4.7 × 5.7 mm, claw ca. 2.3 × 0.6 mm; posterior petal blade ca. 2.8 × 3.4 mm, claw ca. 2.8 × 0.6 mm. *Stamens* free at base; anthers sericeous; connectives ca. 2 × 0.5 mm, surpassing the

anther sacs in ca. 0.7 mm; filaments ca. 2.2×0.8 mm, sericeous at base. *Ovary* ca. 1×0.7 mm, glabrous; styles ca. 3.3×0.3 mm. *Drupes* ca. 6.6×6 mm, glabrous, smooth, globose.

Specimen examined:—BRAZIL.. Bahia: Municipio de Morro do Chapéu. Fazenda Santa Maria, $11^{\circ}45'42''\text{S}$, $41^{\circ}08'31''\text{W}$, 991 m, 16 March 1996, bud, fl., A.A. *Conceição 2468* (ALCB! HUEFS, CEPEC).

Additional specimen examined:— BRAZIL. Espírito Santo. São Pedro, pedra do CEIER, $19^{\circ}01'22.2''\text{S}$, $40^{\circ}38'52.8''\text{W}$, 200-550 m, 26 April 2006, fr., V. *Demuner 2242* (MBML! CEPEC).

Notes:—*Byrsonima nitidifolia* is endemic to Brazil, occurring in the states of Pernambuco, Bahia, Ceará, and Espírito Santo in the Atlantic Forest, Cerrado, and Caatinga domains (Francener 2020). *Byrsonima nitidifolia* is a tree characterized by leaf blades oblong, elliptic to lanceolate. It resembles *Byrsonima bahiana* but has accrescent fleshy sepals in fruits, bigger drupes (ca. 8.8 mm), the reddish color on the leaves margins, and the midrib.

14. *Byrsonima perseifolia* Grisebach (1839: 257). Figure 5C.

Trees, 10–12 m tall. *Stipules* ca. 2.8×1.5 mm, free, triangular. *Leaf blades* $6.7\text{--}15.5 \times 3.2\text{--}4.8$ cm, elliptic, base attenuate, margins flat to slightly revolute, apex acute to falcate, both sides glabrous, midrib prominulous on both sides, laterals veins impress on both sides and number of 10; petioles $7\text{--}26 \times 1,2$ mm. *Thyraxes* 1-flowered cincinnus with ca. 25 flowers, main axis ca. 9.37 cm long, slightly sericeous; bracts ca. 1.5×0.8 mm, triangular, tomentose both sides; peduncles ca. 1.6×0.4 mm; bracteoles ca. 1.3×0.8 mm, triangular; pedicels ca. 10.5×0.5 mm, tomentose; sepals 3×1.6 mm, abaxial side tomentose, adaxial side glabrescent, revolute at anthesis, triangular, not accrescent in fruits; glands ca. 2.5×1 mm; all

petals white to pink becoming pink in age; lateral petals blade ca. 3.5×2.3 mm, claw ca. 1.5×0.6 mm; posterior petal blade 2.5×2.2 mm, claw ca. 2.1×0.6 mm. *Stamens* free at base; anthers glabrous or with few trichomes between anthers sacs; connectives ca. 1.1×0.6 mm, not surpassing the anther sacs; filaments 1.1×0.3 mm, sericeous at base. *Ovary* ca. 2×1.3 mm, glabrous; styles ca. 2.7×0.4 mm. *Drupes* 8–9 mm diam., glabrous, verrucous, globose.

Specimens examined:—BRAZIL: Minas Gerais, Santana do Riacho, Serra do Cipó, encosta oeste, estrada Santana do Riacho-Lapinha, $19^{\circ}08'17''\text{S}$, $43^{\circ}41'41''\text{W}$, 1090 m, 05 March 1998, fr., *J.R. Pirani 4211* (SPF, SP).

Additional specimens examined:—BRAZIL. Espírito Santo, Domingos Martins, BR 262, Rio Jucu, braço Sul, 17 January 1995, bud, fl., *G. Hatschbach 61600* (MBML! NY, CEPEC, MO, HUEFS, SPF, HUCS, SP, FLOR, BHCB, MBM, ASU).

Notes:— *Byrsonima perseifolia* is endemic of Brazil, occurring in the states of Minas Gerais, Rio de Janeiro, Espírito Santo and São Paulo, in the Atlantic Forest and Cerrado domains (Francener 2020). Its shrubby habit, large, glabrous, and elliptical leaves, large petioles, white petals, often with undulate margins, characterize it. The closest species is *B. nitidifolia*, but this one has a smaller size, abaxial side of leaves shiny and sericeous anthers.

15. *Byrsonima rigida* A.Jussieu (1840: 334). Figure 3B.

Shrubs, ca. 40 cm tall. *Stipules* ca. 1.3×0.8 mm, free, triangular. *Leaf blades* $2.7\text{--}9.5 \times 1.7\text{--}4.7$ cm, elliptic to obovate to oblong, base cuneate, margins slightly revolute, apex rounded to subemarginate, both sides glabrous, midrib prominulous on both sides, lateral veins impressed on both sides and number of ca. 8; petioles ca. 4×0.8 mm, glabrous. *Thyraxes* 1-flowered cincinnus with ca. 24 flowers, main axis ca. 5.7 cm long, sericeous; bracts ca. $2.4 \times$

1.4 mm, triangular, abaxial side tomentose, adaxial side glabrous; peduncles 0–1.2 mm; bracteoles ca. 2.1×1 mm, triangular; pedicels ca. 14×1.8 mm, tomentose; sepals ca. 4×2.7 mm, both side glabrous, slightly revolute on apex, ovate, not accrescent in fruits; glands ca. 1.2×0.8 mm; *Flowers* not seen [according to Rolim (2004) all petals white to pink, lateral petals blade $2.5\text{--}4 \times 5\text{--}6$ mm, claw ca. 4×0.4 mm; posterior petal blade ca. 3×4 mm, claw ca. $3 \times 0.3\text{--}1$ mm. *Stamens* free at base; anthers glabrous; connectives ca. 1.3×0.1 mm, not surpassing the anther sacs; filaments $3\text{--}3.4 \times 0.4$ mm, sericeous at base. *Ovary* ca. 6×6 mm, glabrous; styles ca. 5 mm length. *Drupes* not seen [according to Rolim (2004), $4\text{--}5 \times 4\text{--}5$ mm, glabrous, globose].

Specimen examined:—BRAZIL. Bahia. Morro do Chapéu. Estrada de terra para as torres de transmissão, $11^{\circ}35'49''\text{S}$, $41^{\circ}12'47''\text{W}$, 1285m, 10 November 2017, old fl., *L.L. Alves* 225 (HUFSJ!, HUEFS!, ESAL!).

Notes:—*Byrsonima rigida* is endemic to Brazil on the Cerrado domain. It occurs in Bahia, Tocantins, Minas Gerais, São Paulo, and all the Midwest states (Francener 2020). According to the national flora center (CNCFlora 2021), *B. rigida* is considered as Least Concern (LC) according to the IUCN (2012) conservation criteria. Shrubby habit, all petals white to pink, leaves and anthers glabrous, and connective not surpassing the anther sacs characterize the species. *Byrsonima rigida* resembles *B. triopterifolia* and *B. morii*. The last one presents posterior petal yellow, larger size (ca. 2 m tall), and anther glabrous with few trichomes between the anther sacs. *Byrsonima triopterifolia* is taller (0.7–3 m tall), leaves widely elliptic to obovate with apex cuspidate to apiculate to rounded.

16. *Byrsonima spinensis* W.R. Anderson (1982: 109). Figure 5D.

Trees, 3–6 m tall. *Stipules* 2.7–3 × 0.8–1 mm, free to slightly connate, triangular. *Leaf blades* 1.8–6 × 0.9–2.2 cm, elliptic to obovate, base attenuate to cuneate, margins flat to slightly revolute, apex rounded to acute, both sides glabrous to glabrescent, midrib and laterals veins prominulous on both sides and number of ca. 6; petioles 2–5 × 0.8–1 mm, slightly sericeous. *Thyrse*s 1–2 flowered cincinni with ca. 18 flowers, main axis 5.7–7 cm long, tomentose; bracts ca. 2.4 × 0.7 mm, lanceolate to triangular, abaxial side slightly tomentose to sericeous, adaxial side glabrous; peduncles 0–1.2 mm; bracteoles ca. 1.8 × 0.6 mm, triangular; pedicels ca. 4.5 × 1 mm, sericeous to tomentose; *Flowers* not seen [according to Anderson (1982), sepals 1.5–2.3 × 2–2.5 mm, both sides slightly sericeous, revolute at anthesis, obtuse to rounded, not accrescent in fruits; glands 1.6–2.5 mm long; all petals white becoming pink in age; lateral petals blade 4–5.5 × 4.6–6 mm, claw 2.5–3.5 mm long; posterior petal blade 3–3.5 × 4–4.5 mm, claw 2.7–3 mm long. *Anthers* glabrous; connectives surpassing the anther sacs in 0.7–1.1 mm; filaments 2–2.5 mm long, sericeous at base. *Ovary* 1–1.1 mm high, glabrous; styles 3.1–3.7 mm long]. *Drupes* ca. 5 × 3.4 mm, glabrous, smooth, globose.

Specimens examined:—BRAZIL: Unknown municipality, Ca. 8 km North of Gouveia on road to Diamantina, 1220 m, 4 February 1972, bud, fl., *W.R. Anderson 35339* (NY, UB, INPA); Ca. 5 km SSE of Pico do Itambé, 1140 m, 14 February 1972, bud, fl., *W.R. Anderson 35970* (NY, MO, UB, MBM, US, RB); Na estrada para o rio Ventania, Grão Mogol, 750 m, 13 December 1989, bud, fl., *P.T. Sano 12678* (NY); Ca. 5 km SSE do Pico de Itambé, 14 February 1972, bud, fl., fr., *W.R. Anderson 35969* (MO, NY, US, R-tipos, UB, MBM).

Notes:—*Byrsonima spinensis* is endemic to Brazil. Occurs in the state of Minas Gerais in the Cerrado domain (Francener 2020). It is characterized by tree-shaped, long petiole (up to 5 mm long) and thyrses 1–2 flowered cincinni. *Byrsonima spinensis* resembles *B. ligustrifolia*, but

the latter presents longer leaves (2.8–11 cm length), bigger fruits (up to 9 mm diam.), and all petals white to pink becoming red in age, the claw of posterior petal yellow.

17. *Byrsonima triopterifolia* A.Jussieu (1840: 334). Figure 3E.

Shrubs, 0.7–3 m tall. *Stipules* ca. 0.8–3 × 0.5–2 mm, free to slightly connate, triangular. *Leaf blades* 1.2–5 × 0.7–3.2 cm, widely elliptic to obovate, base attenuate to cuneate, margins flat to slightly revolute, apex cuspidate to apiculate to rounded, both sides glabrous, midrib prominulous on both sides, laterals veins impress on both sides and number of 6; petioles 2–3 × 1–1.5 mm, glabrous to glabrescent. *Thyrse*s 1-flowered cincinnus with ca. 15 flowers, main axis 3.5–8.2 cm long, slightly sericeous; bracts 1.6–2 × 1.2 mm, ovate, both side glabrous, most of the time they keep their green color and the tender texture even after drought; peduncles absent; bracteoles 1.3–1.5 × 0.7–1 mm, ovate; pedicels 3.8–6.3 × 0.5 mm, slightly sericeous to sericeous; sepals 1.4–2 × 1.3–1.6 mm, both sides glabrous, not revolute at anthesis, ovate, not accrescent in fruits; glands 1.3–2 × 1–1.6 mm; all petals white to pink; lateral petals blade 2.4–3 × 3.4–4.4 mm, claw 1.4–2.7 × 0.6 mm; posterior petal blade 2.4 × 2.3–3.4 mm, claw 2.6–3 × 0.6–0.8 mm. *Stamens* free at base; anthers glabrous; connectives 0.8–1.2 × 0.3–0.6 mm, not surpassing the anther sacs; filaments 1.3–2 × 0.3–0.4 mm, sericeous at base. *Ovary* ca. 0.1–1 × 1–1.2 mm, glabrous; styles ca. 2–2.7 × 0.3–0.4 mm. *Drupes* 4.6–5 × 3–4.4 mm, glabrous, verrucous, globose.

Specimens examined:—BRAZIL. Bahia: Andaraí, estrada de chão de Mucugê para igatu, 13°1'44"S, 41°21'4"W, 780 m, 28 January 2015, bud, fl., *D.S. Carneiro-Torres 1282* (HUEFS!); Chapada Diamantina, Trilha Andaraí-Pati, 12°47'54"S, 41°21'13"W, 668 m, 25 February 2009, bud, fr., *M.L. Guedes 14592* (ALCB! US). Jacobina, Serra do Brite, 11°09"S, 40°01"W, 21 August 1984, fl., fr., *R.P. Orlandi 699* (ALCB! TEPB, HUEFS, MBM); Morro

vizinho ao Monte Tabor, 11°10'11"S, 40°30'39", 655 m, 24 June 1999, fl., *F. França* 3084 (HUEFS! CEPEC, CEN, ALCB); Serra do Cruzeiro, 11/12'24"S, 40°28'55"W, 1040 m, 7 April 2001, fl., *T. Ribeiro* 159 (ALCB! UESC, HUEFS, CEPEC); Piemonte da Diamantina Bairro Bananeira, 11°10'49"S, 40°29'53"W, 23 November 2001, fl., *D.M. Loureiro* 454 (ALCB!, MBM, CEPEC). Lençóis, 24 April 1979, bud, *L.R. Noblick* 1194 (ALCB!); Chapada Diamantina, Mucugê, córrego do Boiadeiro, 14°32'05"S, 42°31'22"W, 930 m, 12 July 2011, st., *F. Hurbath* 185 (ALCB!). Licínio de Almeida, 2Km antes da entrada da cidade, 14°32'4"S, 42°31'51"W, 10 January 2006, fl., *T.S. Nunes* 1640 (HUEFS! CEPEC). Mucugê, 12°58'12"S, 41°20'06"W, 1140 m, 31 January 1997, bud, fl., *M.L. Guedes* 4751 (ALCB! US). Morro do Chapéu, cachoeira do Ferro Doido, 11°37'42"S, 41°00'03"W, 5 March 1997, fl., *L.B. da Silva* 6030 (ALCB! US); Guariba, 11°26'24"S, 41°11'39"W, 1073 m, 4 May 2007, fl., *F. França* 5646 (HUEFS! CEPEC, ALCB); Chapada Diamantina, Cachoeira do Ferro Doido, 11°13'S, 41°09'W, 24 March 2016, fl., *M.L. Guedes* 24449 (ALCB!). Piemonte da Chapada. 11°20'43"S, 40°31'15"W, 1164 m, 3 August 2006, bud, *F.A. Santana* 29 (ALCB!). Rio de Contas, Chapada Diamantina estrada para o Pico das Almas, 12 Km da bifurcação. 13°31'05"S, 41°54'27"W, 6 December 2003, fl., *N. Roque* 996 (ALCB!); Estrada Real, parte mais alta, na margem do rio, 13°32'S, 41°57'W, 2 January 2000, fl., *A.M. Giuliatti* 1641 (HUEFS!); Chapada Diamantina, subida para o pico das almas, depois do campo do Queiroz, 13°31'35"S, 41°57'51"W, 1724 m, 27 January 2015, bud, fl., *A.Q. Lima* 113 (ALCB! CEPEC, HUEFS). Unknown municipality, Serra de Jacobina, Pico do Jaraguá, 11°10'21"S, 40°29'40"W, 1010 m, 3 April 1996, bud, fl., *A.M. Giuliatti* 2779 (ALCB!).

Notes:—*Byrsonima triopterifolia* is endemic of Brazil. It occurs in the state of Bahia in the Cerrado domain (Francener 2020). It is characterized by leaves, bracts and bracteoles glabrous, anthers glabrous, connectives not surpassing the anther sacs and most leaves with apiculate or acuminate apex. The bracts are very peculiar, most of the time they keep their

green color and the tender texture even after drought. *Byrsonima triopterifolia* resembles *B. rigida*, as mentioned in the comments this specie.

18. *Byrsonima umbellata* Martius ex A.Jussieu (1840: 334). Figure 3C.

Shrubs to trees, 0.8–8 m tall. *Stipules* 1.5–4 × 2–4 mm, free, triangular. *Leaf blades* 4.5–13.5 × 2.4–7.8 cm, oblong, less often ovate to obovate, base subcordate to cordate, margins slightly revolute, apex rounded, less often acute to obtuse, both sides glabrous, midrib and laterals veins prominulous on both sides and number of 6-8; petioles 0–0.4 mm, glabrous. *Thyrse*s 1-flowered cincinnus, main axis 2.8–8.5 cm long, slightly sericeous; bracts 1–1.5 × 1–1.5 mm, ovate, less often oblong, both sides glabrous to glabrescent; peduncles absent; bracteoles 0.8–1.5 × 0.5 mm, ovate to narrowly ovate; pedicels 0.8–1.8 mm, glabrous to sericeous; sepals ca. 1 × 1 mm, abaxial side sericeous to slightly sericeous, adaxial side glabrous, flat to revolute on apex, oblong to obovate, not accrescent in fruits; glands 1–2 × 0.5–1 mm; all the petal white or with pink claw and white blade; lateral petals blade 4–4.8 × 5.6–6 mm, claw ca. 1.8 × 0.8 mm; posterior petal blade ca. 4.5 × 5.2 mm, claw ca. 4 × 1 mm. *Stamens* free to slightly connate at base; anthers glabrous; connectives 1.2–1.5 × 0.9 mm, surpassing the anther sacs in 0.5–0.8 mm; filaments 2.6–3 × 0.4–0.7 mm, sericeous at base. *Ovary* ca. 1.7 × 1.8 mm, glabrous; styles ca. 5 mm. *Drupes* 4.5–6 × 5–5.5 mm, glabrous, globose (Rolim 2004).

Specimen examined:—BRAZIL. Minas Gerais: Serro, *C.F.P. Martius s.n.* (M 0080952, M 0080953).

Notes:—*Byrsonima umbellata* is endemic to Brazil. It occurs in the state of Minas Gerais, Paraná, Pará, Tocantins, Bahia, Maranhão, Piauí, and across the Midwest in the domains of Cerrado and Amazon (Francener 2020). It is characterized by the inflorescence concentrated

at the apex, leaves obovate to ovate and base subcordate to cordate, and all petals white to pink. It resembles *B. cipoensis* and *B. brachybotrya*, but the last two presents posterior petals yellow, smaller leaves with different base shapes. The only record of *B. umbellata* for the Espinhaço Range is the type, from the city of Serro Frio, currently named Serro (Minas Gerais).

19. *Byrsonima vacciniifolia* A.Jussieu (1825: 84). Figure 3D.

Shrubs, 1–2 m tall. *Stipules* ca. 1.2×0.3 mm, free to slightly connate, lanceolate. *Leaf blades* $1.7\text{--}6.2 \times 0.84\text{--}3$ cm, elliptic to obovate, base attenuate, margins flat to slightly revolute, apex rounded to subemarginate, both sides glabrous to glabrescent with trichomes principally in midrib, midrib and laterals veins prominulous on both sides and number of ca. 6; petioles $0.8\text{--}2 \times 0.6$ mm, glabrous to lightly tomentose. *Thyrse*s 1-flowered cincinnus with 14–18 flowers, main axis 5.8–7 cm long, tomentose; bracts ca. 2×0.8 mm, oblong, abaxial side tomentose, adaxial side glabrous with trichomes on margins; peduncles absent; bracteoles ca. 1.8×0.4 mm, lanceolate; pedicels $2\text{--}7.7 \times 0.7\text{--}1$ mm, densely tomentose; sepals ca. 3.6×2 mm, both sides tomentose, revolute on apex, ovate, not accrescent in fruits; glands ca. 2.2×1 mm; all petals white with claw pink, lateral petals blade ca. 2.7×3.7 mm, claw $2\text{--}2.6 \times 0.4\text{--}0.5$ mm; posterior petal blade ca. 2.5×4.5 mm, claw ca. 3.3×0.5 mm. *Stamens* free at base; anthers sericeous; connectives $1.6\text{--}1.8 \times 0.4\text{--}0.5$ mm, surpassing the anther sacs in 0.3–0.8 mm; filaments ca. 1.5×0.5 mm, sericeous at base. *Ovary* ca. 1×0.8 mm, glabrous; styles $1.4\text{--}2.2 \times 0.2\text{--}0.3$ mm. *Drupes* not seen [according to Rolim (2004), 5–9.5 mm diam., glabrous, globose].

Specimens examined:—BRAZIL. Bahia: Caetité, Bom Jesus da Lapa, ca. 10 km de Caetité, 13°58'31"S, 42°32'54"W, 950 m, 6 December 1999, bud, fl., *E. de Melo 3221* (HUEFS! CEPEC). Minas Gerais: Diamantina, estrada para Conselheiro da Mata, 29 November 2002, bud, fl., *L.G. Temponi 253* (SPF), Parque Estadual do Biribiri, 18°06'59"S, 43°34'46"W, 1039 m, 2 November 2017, bud, *L.L. Alves 194* (HUFSJ!). Grão Mogol, ca. 3 Km a partir da ponte na Rod. Para Cristália, 16°35'29"S, 42°52'45"W, 700 m, 12 January 2006, fl., *J.G. Jardim 4944* (HUEFS! CEPEC); Estrada de terra. Entre as cidades de Montes Claros para Grão Mogol, 16°33'75"S, 42°51'83"W, 995 m, 4 November 2017, bud, fl., *L.L. Alves 204* (HUFSJ! ESAL). Monte Azul, Serra da Formosa em frente ao Pico da Formosa, 15°13'48"S, 42°48'14"W, 1341 m, 27 October 2010, bud, *L.P. de Queiroz 15015* (HUEFS! SP). Santana do Riacho. Serra do Cipó, 19°18'29"S, 43°36'46"W, 1043 m, 31 October 2017, fl., *L.L. Alves 180* (HUFSJ! ESAL).

Notes:—*Byrsonima vacciniifolia* is endemic to Brazil. It occurs in the state of Bahia, Piauí, Goiás, and Minas Gerais in Caatinga and Cerrado domain (Francener 2020). It is characterized by small leaves with rounded or subemarginate apex, anthers sericeous, and connective that surpassing the anther sacs (up to 0.8 mm). It resembles *B. gardneriana*, but the last presents greater variation in the shape of the leaves, obovate to widely elliptic to oblong, anthers glabrous, and connective that surpassing the anther sacs in (0.7–1.1 mm).

20. *Byrsonima variabilis* A.Jussieu (1832: 78). Figure 3F.

Shrubs to small trees, 1–4 m tall. *Stipules* 3.2–3.6 × 2 mm, free, triangular. *Leaf blades* 2.8–7.7 × 0.9–4 cm, elliptic to obovate to oblong, base cuneate to truncate to attenuate, margins slightly revolute, apex rounded to acuminate to subemarginate to obtuse, abaxial side densely tomentose, adaxial side glabrescent with trichomes in midrib, midrib prominulous on both

sides, laterals veins impress on both sides and number of ca. 7; petioles $3.7\text{--}4.6 \times 1.4\text{--}1.5$ mm, tomentose. *Thyraxes* 1-2 flowered cincinni with ca. 30 flowers, main axis $5.5\text{--}8.2$ cm long, densely tomentose; bracts ca. $1.6\text{--}6 \times 0.6\text{--}1$ mm, lanceolate, abaxial side tomentose, adaxial side glabrous to glabrescent; peduncles $0\text{--}0.7$ mm; bracteoles $1.4\text{--}3 \times 0.6\text{--}0.7$ mm, lanceolate; pedicels $3.3\text{--}6.8 \times 1\text{--}1.4$ mm, densely tomentose; sepals ca. 2.3×2 mm, abaxial side tomentose, adaxial side glabrous to glabrescent, not revolute on apex, ovate, not accrescent in fruits; glands ca. 2.2×2 mm; lateral petal white to pink, blade ca. 3.4×3 mm, claw ca. 1.6×0.6 mm; posterior petal yellow turning red in age, blade ca. 2.6×3 mm, claw ca. 1.4×1 mm. *Stamens* free at base; anthers glabrous; connectives ca. 1.8×0.4 mm, not surpassing or surpassing slightly the anther sacs (up to 0.3 mm long); filaments ca. 1.5×0.4 mm, sericeous at base. *Ovary* ca. 1.4×1.2 mm, glabrous; styles ca. 2.4×0.3 mm. *Drupes* $4.3\text{--}8 \times 4.1\text{--}5$ mm, glabrous, smooth, globose.

Specimens examined:—BRAZIL. Minas Gerais: Conceição do Mato Dentro, Fazenda Boa Esperança - margem esquerda da Rodovia MG 010- Belo Horizonte - Conceição do Mato Dentro Km 145 da rodovia, fl., fr., *N. Roque 144* (ALCB! SPF). Santana do Riacho, MG 010, sentido Serro, à direita da rodovia, $19^{\circ}13'43''\text{S}$, $43^{\circ}30'24''\text{W}$, 14 October 2011, bud, *C. Snak 673* (HUEFS!). Santo Antônio do Itambé, Pico do Itambé, $18^{\circ}24'7''\text{S}$, $43^{\circ}18'51''\text{W}$, 1400 m, 5 February 2008, fr., *A. Rapini 1698* (HUEFS!);

Notes:—*Byrsonima variabilis* is endemic to Brazil. It occurs in the state of Minas Gerais, Rio de Janeiro, São Paulo and Bahia in the Cerrado and Atlantic Forest domain (Francener 2020). According to the national flora center (CNCFlora 2021), *B. variabilis* is considered as Least Concern (LC) according to the IUCN (2012) conservation criteria. It is characterized by posterior petal yellow and laterals petals white to pink, abaxial side of the leaves densely tomentose, ferruginous. *Byrsonima variabilis* resembles *B. bumeliifolia* and *B. macrophylla*. Both comparisons can be verified in the comments of *B. macrophylla*. and *B. bumeliifolia*.

Excluded species of pink- and whit-flowered *Byrsonima* from Espinhaço Range

1. *Byrsonima microphylla* A.Jussieu (1840: 334)

This species has been well collected in recent years along the coast between the cities of Salvador and Itapuã, presuming that Blanchet's types came from the same area in Bahia, growing in restinga vegetation, in white dunes (Anderson 1993). *Byrsonima microphylla* resembles *B. blanchetiana*, both share the colors of the petals, habitat and indumentum of the leaves, but *B. microphylla* has glabrous anthers and connective surpassing the anther sacs up to 0.1 mm, while *B. blanchetiana* has anthers slightly hirsute with the connective surpassing the anther sacs in 0.5-0.9 mm (Rolim 2004). Some collections were identified as *B. microphylla* from the Morro do Chapéu region of Bahia, *J.L. Hage 2299* (MBM), *L.L. Alves 221* (HUFESJ) and *N. Roque 1686* (MAC). They were discarded as such due to the yellow flowers (information contained in the exsiccate labels). The collection *M.L. Guedes 24449* (ALCB) filed under this name, was identified by us as *B. triopterifolia* due to its rounded leaves with cuspidate apex and bracts with green color and the tender texture even after drought. We were not able to confirm the collections *A.M. Carvalho 4243* (MBM) and *F.B.L. Silva 20* (HUEFS) due to the lack of flowers and the non-physical examination of the material. So far the authors cannot confirm the presence of *B. microphylla* for the Espinhaço Range.

2. *Byrsonima myricifolia* Grisebach (1875: 125).

The collection *N. Hensold 749 / CFCR 3912* (SPF), was cited in the speciesLink database (2021) under this name. Nevertheless, we examined this specimen and identified it as *Byrsonima dealbata*, a shrub 1m tall with congested yellow petals and abaxial side of the

leaves tomentose, while *B. myricifolia* is characterized by white to pink petals, tree 4–14 m tall, and abaxial side of the leaves glabrous to glabrescent (Francener 2020).

3. *Byrsonima oblongifolia* A.Jussieu (1843: 300)

Three collections are identified as *B. oblongifolia* from Espinhaço Range in the speciesLink database (2021). The collection *L.G. Temponi 253* (SPF), was identified by us as *B. vacciniifolia* for having smaller and elliptical leaves. The collections *H.L.M. Barreto 12021* (BHCB) and *E.T. Neto 4178* (BHCB) have long petioles and the abaxial side of the leaves tomentose, indicating that they belong to *B. viminifolia* A.Jussieu (1833: 83); the specimen *Neto 4178* appears to have yellow petals, although it does not record this information on the label. *Byrsonima viminifolia* presents glabrous anthers and sericeous ovary, unlike *B. oblongifolia*; these characters could not be confirmed due to the lack of physical examination of the specimens cited. Therefore, the authors could not confirm the presence of *B. oblongifolia* for the study area.

4. *Byrsonima onishiana* W.R.Anderson (1982: 96)

Two collections are identified as *B. onishiana* from Espinhaço Range in the speciesLink database (2021), *R.C. Mota 1011* (SP) and *R.M. Harley CFCR 6460* (SPF). These collections were identified by us as *B. oxyphylla* for having yellow flowers and narrower leaves. *Byrsonima onishiana* is characterized by the connectives not surpassing or slightly surpassing the anther sacs and by the narrowly oblanceolate leaves. It resembles *B. oblongifolia* due to the size and shape of the leaves, but the anthers of the latter are hirsute the connectives surpass the anther sacs (Rolim 2004).

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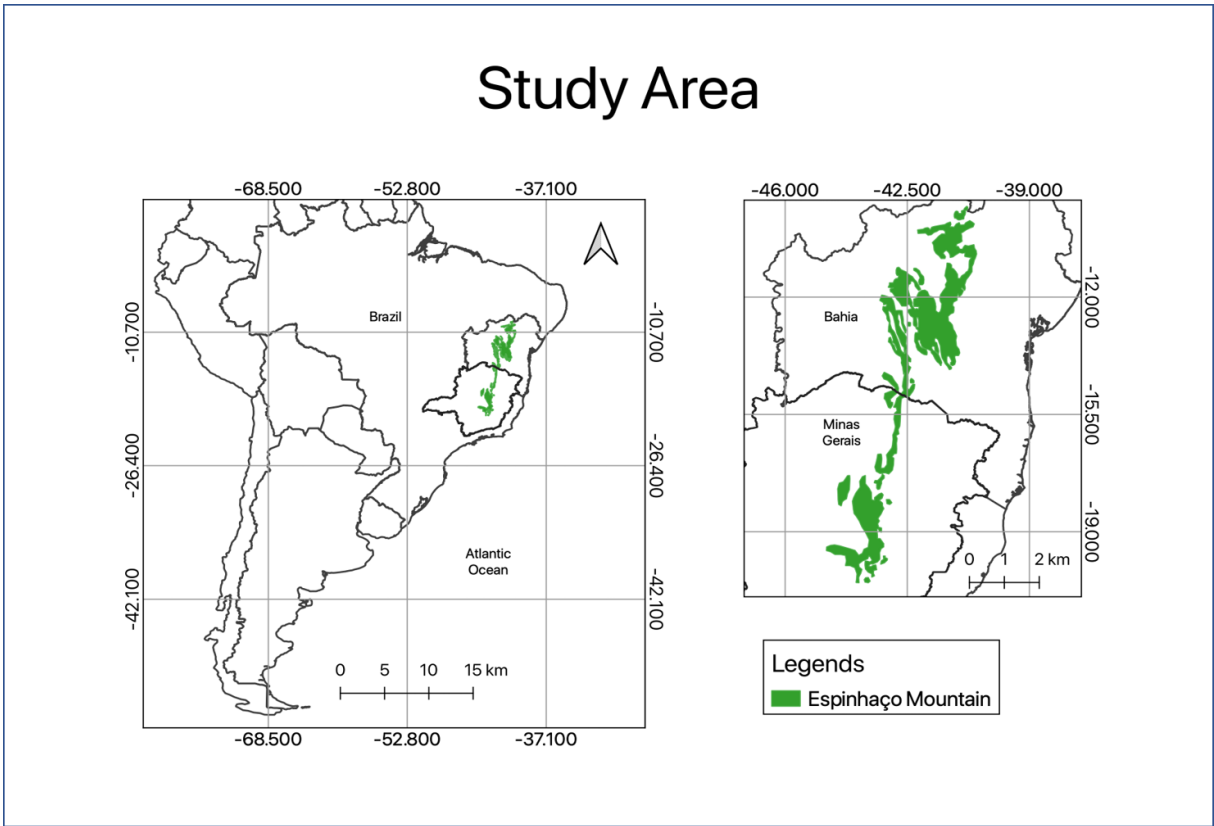


Figure 1: Location map of the Espinhaço range.

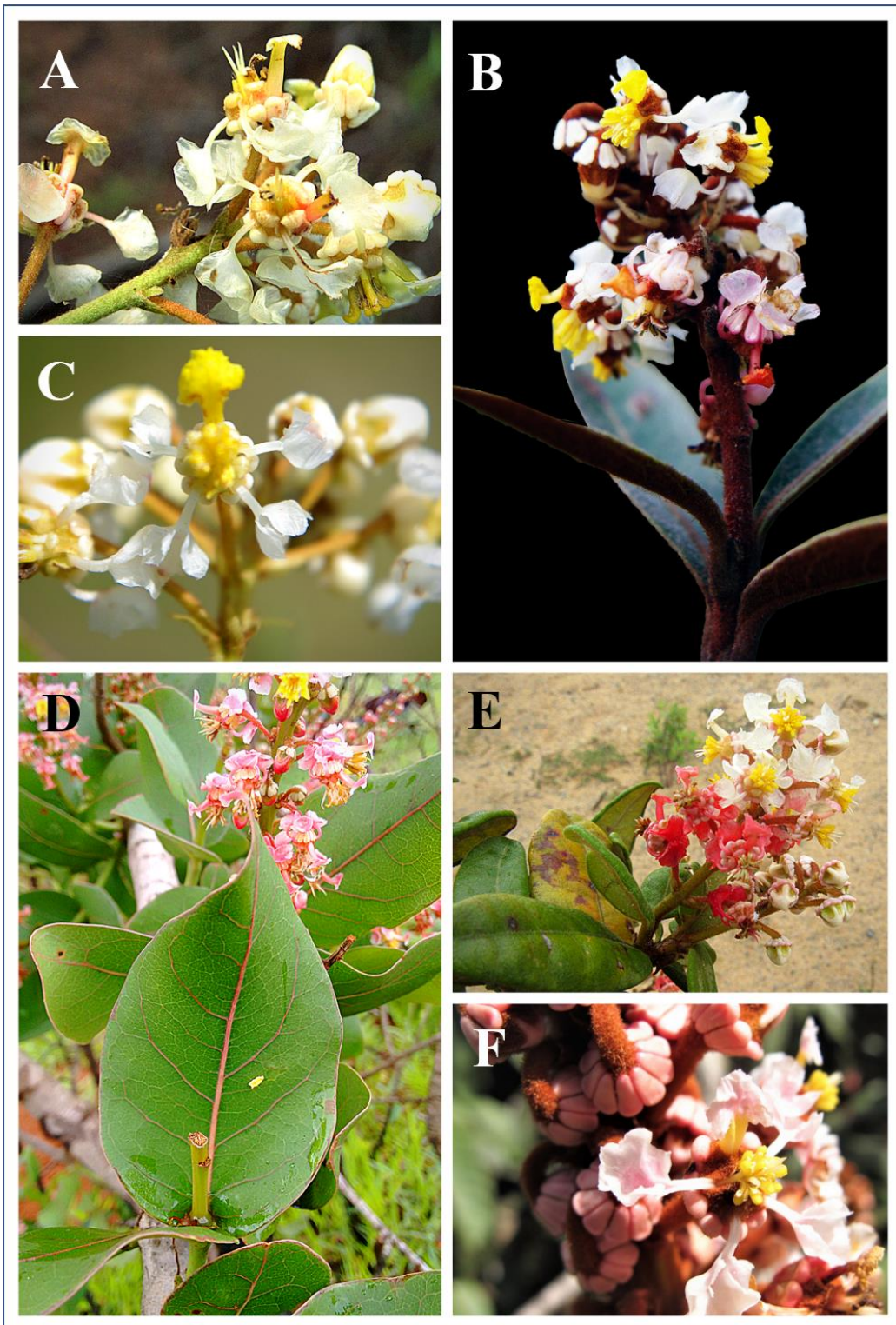


Figure 2: A. *Byrsonima blanchetiana* (photo by L.L. Alves), B. *Byrsonima cipoensis* (Photo by C.F. Hall), C. *Byrsonima brachybotrya* (Photo by C.F. Hall), D. *Byrsonima coccolobifolia* (Photo by L.L. Alves), E. *Byrsonima correifolia* (Photo by L.L. Alves), F. *Byrsonima macrophylla* (Photo by L. Echternacht).

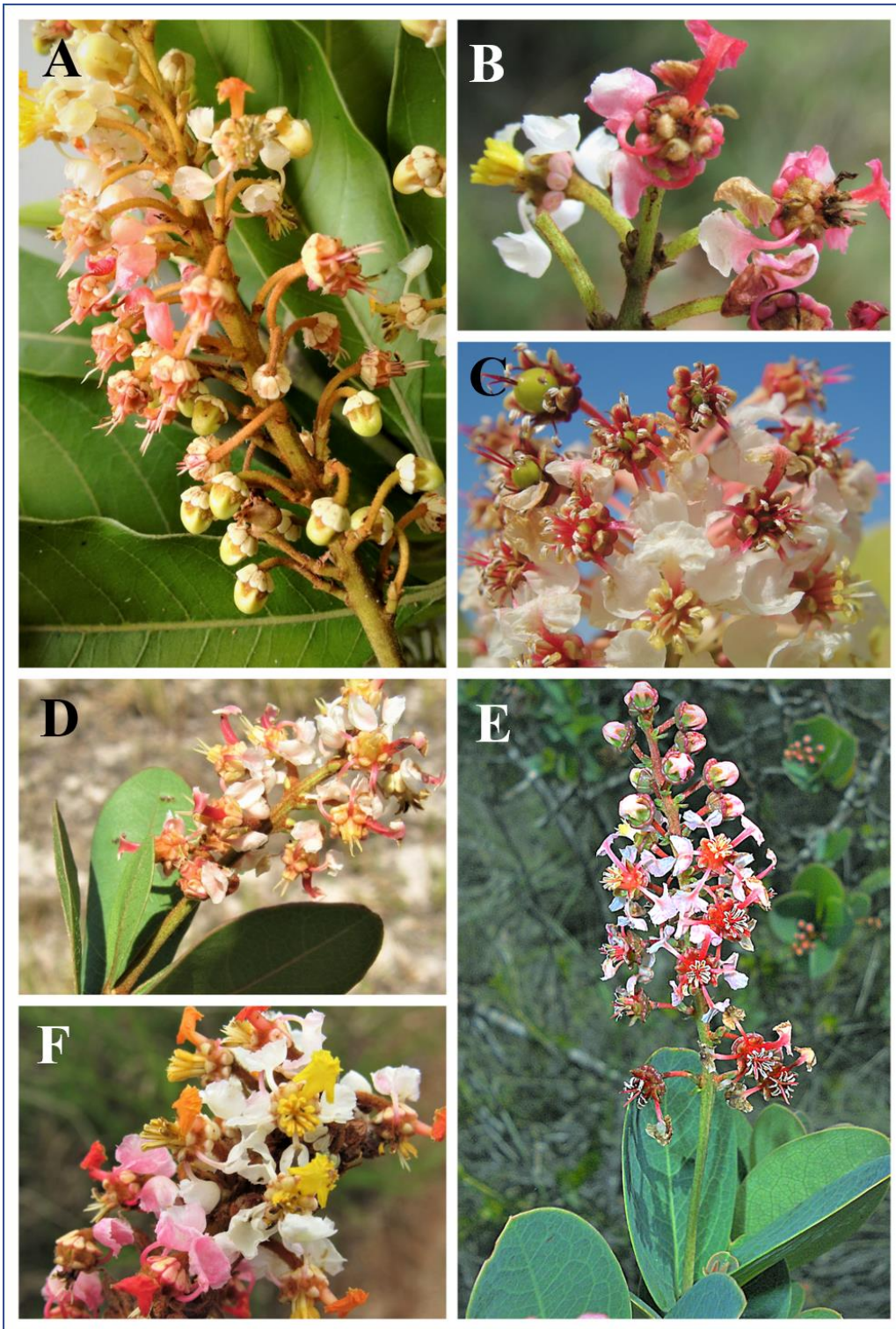


Figure 3: A. *Byrsonima ligustrifolia* (photo by L.L. Alves), B. *Byrsonima rigida* (photos by L.L. Alves), C. *Byrsonima umbellata* (photo by A. Francener), D. *Byrsonima vacciniifolia* (photo by L.L. Alves), E. *Byrsonima triopterifolia* (photo by L.Marinho), F. *Byrsonima variabilis* (photo by L.L. Alves).

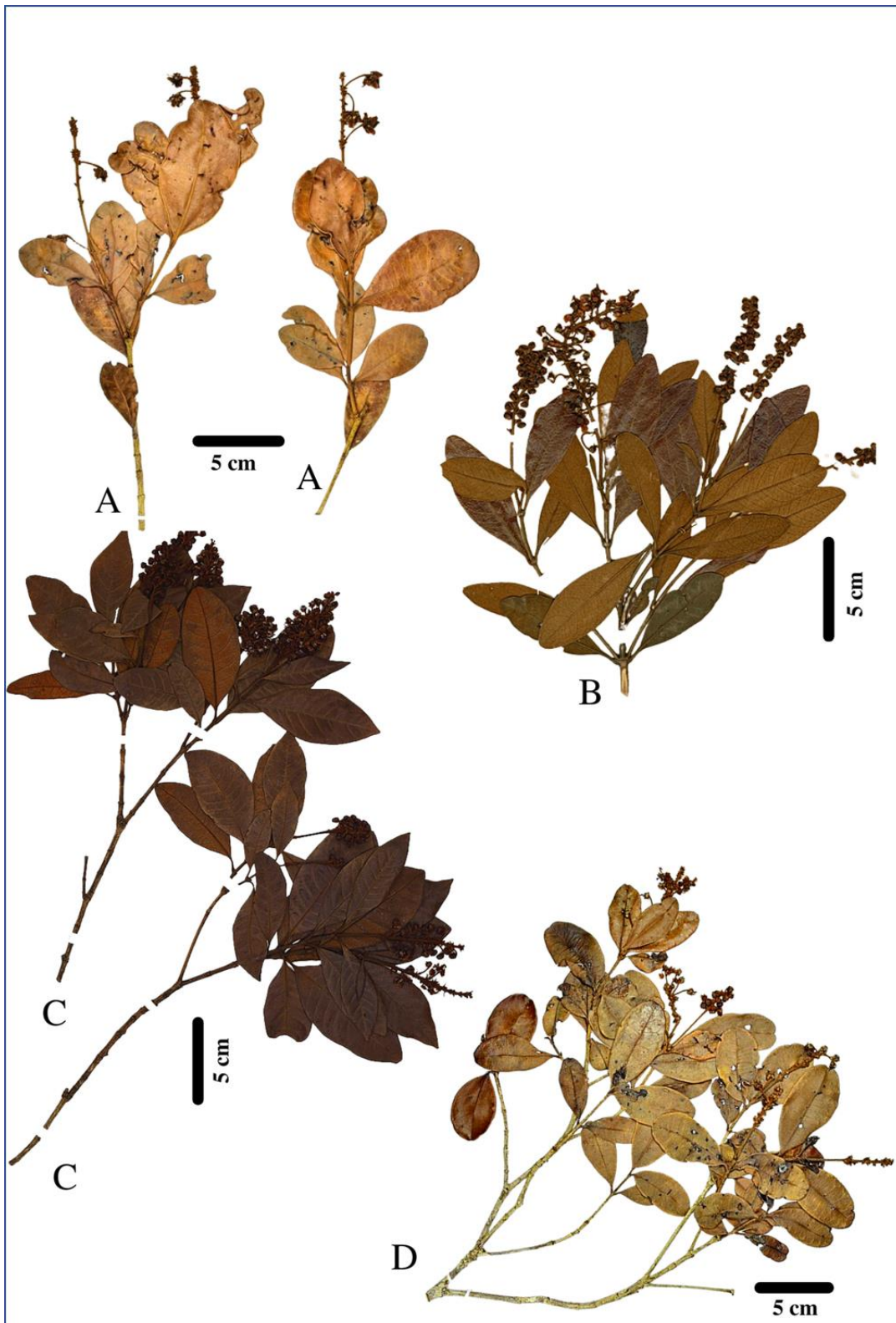


Figure 4: A. *Byrsonima bahiana* (Melo 4525, HUEFS), B. *Byrsonima bumeliifolia* (Saint-Hilaire 1816, P), C. *Byrsonima fonsecae* (Campos s.n., SPF 152760), D. *Byrsonima gardneriana* (Rocha 436, HUEFS).

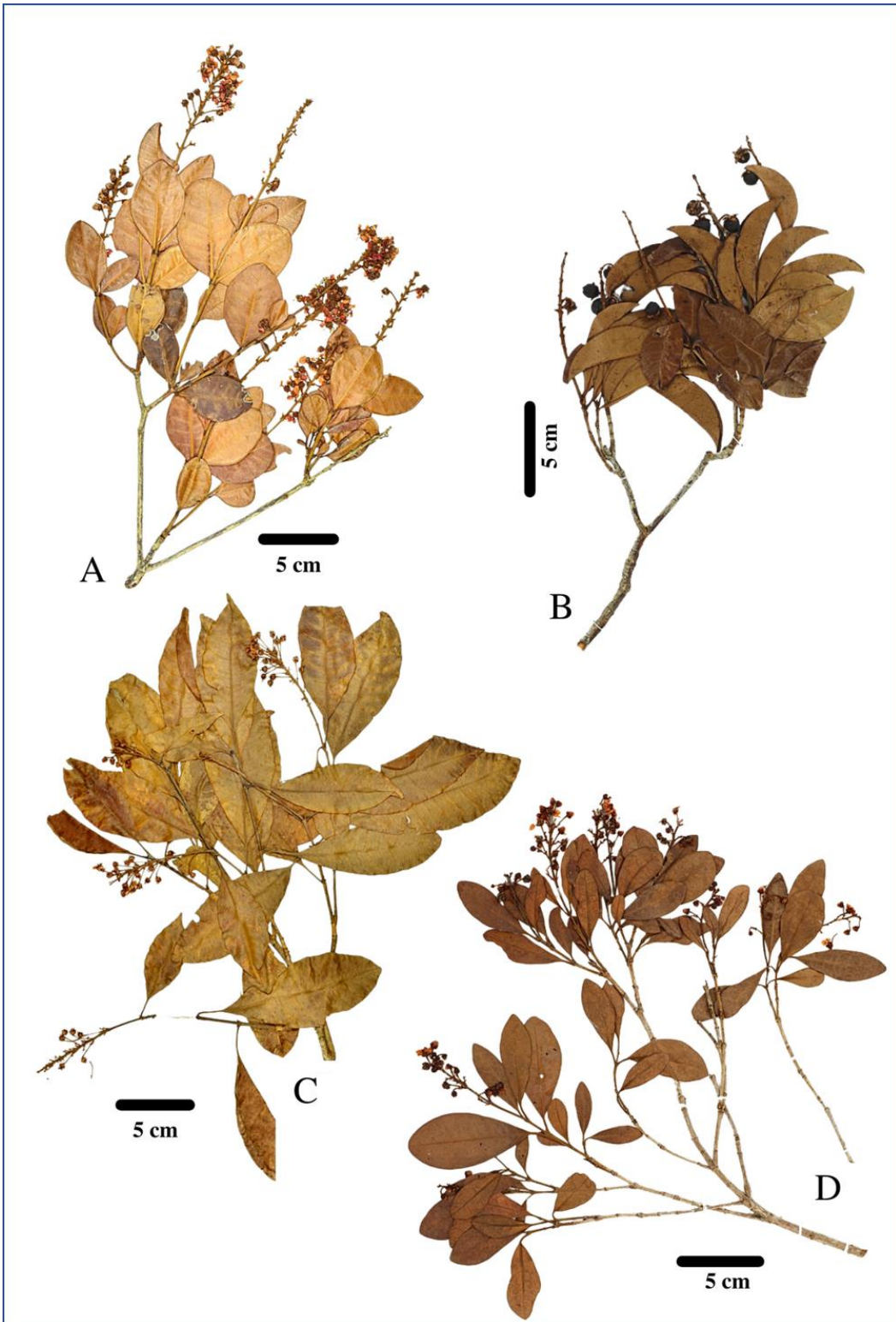


Figure 5: A. *Byrsonima morii* (Giulietti s.n., ALCB 39825), B. *Byrsonima nitidifolia* (Demuner 2242, MBML), C. *Byrsonima perseifolia* (Hatschbach 61600, HUEFS), D. *Byrsonima spinensis* (Anderson 35339, NY).