

Taxonomic synopsis of medicinal Lamiales species used in Alta Floresta, Mato Grosso, Brazil: Potentialities for the Unified Health System

Sinopse taxonômica de espécies medicinais de Lamiales utilizadas em Alta Floresta, Mato Grosso, Brasil: Potencialidades para o Sistema Único de Saúde

Sinopsis taxonómica de especies medicinales de Lamiales utilizadas en Alta Floresta, Mato Grosso, Brasil: Potencialidades para el Sistema Único de Salud

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Abstract

This work presents the morphology of 16 medicinal species of Lamiales used in Alta Floresta, Mato Grosso, Brazil, as well comments about phytogeography, popular use in the municipality, the status of the species in the National Policy on Medicinal Plants and Phytotherapeutics, and examples of preclinical trials. The work was performed between March and September 2020, through botanical sample of the Lamiales species presented in the book "Plantas medicinais de Alta Floresta: com contribuição a etnobotânica", obtained in rural communities and urban neighborhoods in the municipality of Alta Floresta, State of Mato Grosso. The morphological study was carried out at the Laboratory of Plant Morphology, located at the University Campus of Alta Floresta, Universidade do Estado de Mato Grosso. In general, the species are native (56%) with wide distributions in Brazil. Most species have glandular trichomes (72%) on the leaves and/or flowers and have been shown to be efficient and/or promising (85.5%) in studies. However, only 37.5% of these studies were conducted by the Ministry of Health. None of the species are offered as a phytotherapeutic by the Unified Health System (SUS), although six are on the last National Report of Medicinal Plants of Interest published by SUS. Based on the information provided, it is evident that these species could be used in studies about new phytotherapeutics for SUS users.

Keywords: Biodiversity; Botany; Phytotherapeutics; Glandular trichomes.

Resumo

Este trabalho apresenta a morfologia de 16 espécies medicinais de Lamiales utilizadas em Alta Floresta, Mato Grosso, Brasil, além de comentários de fitogeografia, uso popular no município, status das espécies na Política Nacional de Plantas Medicinais e Fitoterápicos, e exemplos de ensaios pré-clínicos. O trabalho foi realizado entre março e setembro de 2020, através de amostra botânica das espécies de Lamiales apresentadas no livro "Plantas medicinais de Alta Floresta: com contribuição a etnobotânica", obtidas em comunidades rurais e bairros urbanos no município de Alta Floresta, Estado de Mato Grosso. O estudo morfológico foi realizado no Laboratório de Morfologia Vegetal, localizado no Campus Universitário de Alta Floresta, Universidade do Estado de Mato Grosso. No geral, são espécies nativas (56%), com ampla distribuição no Brasil. A maioria das espécies possui tricomas glandulares (72%) nas folhas e/ou flores e se mostrou eficiente e/ou promissora (85,5%) em estudos. No entanto, apenas 37,5% desses estudos foram realizados pelo Ministério da Saúde, nenhuma espécie é oferecida como fitoterápico no Sistema Único de Saúde (SUS), embora seis constem na última Relação Nacional de Plantas Medicinais de Interesse científico pelo SUS. Com base nas informações fornecidas, fica evidente que essas espécies podem ser utilizadas em estudos de novos fitoterápicos para usuários do SUS.

Palavras-chave: Biodiversidade; Botânica; Fitoterápicos; Tricomas glandulares.

Resumen

Este trabajo presenta la morfología de 16 especies medicinales de Lamiales utilizadas en Alta Floresta, Mato Grosso, Brasil, así como comentarios sobre fitogeografía, uso popular en el municipio, estatus de la especie en la Política Nacional de Plantas Medicinales y Herbolarios, y ejemplos de ensayos preclínicos. El trabajo se realizó entre marzo y septiembre de 2020, a través de muestra botánica de especies de Lamiales presentada en el libro "Plantas medicinais de Alta Floresta: com contribuição a etnobotânica", obtenida en comunidades rurales y barrios urbanos del municipio de Alta Floresta, Estado de Mato Grosso. El estudio morfológico se realizó en el Laboratorio de Morfología Vegetal, ubicado en el Recinto Universitario de Alta Floresta, Universidade do Estado de Mato Grosso. En general, son

especies nativas (56%), con amplia distribución en Brasil. La mayoría de las especies tienen tricomas glandulares (72%) en hojas y / o flores y han demostrado ser eficientes y / o prometedoras (85,5%) en estudios preclínico. Sin embargo, solo el 37,5% de estos estudios fueron realizados por el Ministerio de Salud, ninguna especie se ofrece como fitoterapia en el Sistema Único de Salud (SUS), aunque seis están incluidas en la última Lista Nacional de Plantas Medicinales de Interés Científico de la SUS. Con base en la información proporcionada, es evidente que estas especies se pueden utilizar en estudios de nuevos medicamentos a base de hierbas para usuarios del SUS.

Palabras clave: Biodiversidad; Botánica; Hierbas medicinales; Tricomas glandulares.

1. Introduction

The order Lamiales is characterized by the following chemical, morphological, anatomical and molecular features: presence of cornosides, verbascosides (phenylethanoid glycosides and caffeic acid esters), methyl- and oxygenated flavones; eglandular multicellular trichomes and glandular trichomes usually present; and leaves opposite, inflorescences cymose, flowers usually zygomorphic, anther sacs with placentoids, fruits capsules, chalazal endosperm haustorium present, cotyledons incumbent and protein bodies in nuclei (Stevens, 2021; APG, 2016; Cole, et al., 2016).

Worldwide, the order comprises 26 families and 23,755 species (Stevens 2001 onwards). In Brazil, it is represented by 18 families and 2,369 species (BFG, 2018; Souza & Lorenzi, 2019; FB, 2020). The representativeness of this taxonomic group can be seen in the book *Plantas medicinais no Brasil: nativas e exóticas*, which includes morphological, biogeographic and medicinal information about 335 species; 45 species belong to Lamiales, the largest order in number of species (notably those of Lamiaceae with 25 species and Bignoniaceae and Verbenaceae with seven species each), followed by Asterales with 43 species (all in the Asteraceae) (Lorenzi & Matos, 2008). The book *Plantas Mediciniais de Alta Floresta: com contribuição à Etnobotânica* contains information about the ethnobotany of 82 species used by residents of the municipality Alta Floresta, in the northern part of Mato Grosso State (MT), including 16 Lamiales species (of which six are in Lamiaceae) and nine Asterales species (all in the Asteraceae) (Fernandes, 2002). Additionally, in Vale do Juruena in northern Mato Grosso, Bieski et al. (2015) conducted an ethnobotanical study of medicinal plants in seven municipalities and found that 40 Lamiales species (12% of the species studied) are used by the population to treat diseases, including 22 Lamiaceae species.

Lamiales species stand out among the medicinal plants in Brazil due to the high number of native and exotic species, the dependence on them to treat diseases of minor or medium complexity, and their chemical compounds with proven pharmacological efficacy. Among the chemical compounds are the following: cornosides that exhibit hypotensive action; flavones that exhibit capillary permeability, antioxidant, anti-inflammatory, antitumor and hormonal activity (Santos, et al., 2011); caffeic acid with antimicrobial activity (Fu, et al., 2010); and phenylethanoid glycosides that have inhibitory effects on neuroinflammation, such as that associated with Alzheimer's and Parkinson's disease (Nan, et al., 2013), anti-inflammatory, antioxidant, antibacterial and antiviral activity, cytotoxic, immunomodulatory, enzyme inhibiting effects, and pharmacokinetic properties (Xue & Yang, 2016).

Even with the proven pharmacological efficacy of Lamiales chemical compounds, the group has been poorly explored in relation to the production of phytotherapeutic medicines that are destined for Brazil's Unified Health System (Sistema Único de Saúde or SUS). Of a total of 12 species, only *Mentha piperita* Linnaeus and *Plantago ovata* Forsskål are listed as sources of phytotherapeutics in the National Report of Essential Medicines (Relação Nacional de Medicamentos Essenciais) (Brasil, 2020). To broaden this scenario, the National Policy on Medicinal Plants and Phytotherapeutics (Política Nacional de Plantas Mediciniais e Fitoterápicas) was created (approved by Decree N° 5.813 on 22 June 2006), which established guidelines and lines of research for the sustainable use of Brazilian biodiversity (Brasil, 2006a, 2006b, 2006c; Castro & Figueiredo, 2019).

With 38,750 plant species, Brazil is a megadiverse country (BFG, 2018; FB, 2020) with ethnic groups that have knowledge about medicinal plants (Brasil, 2016). Based on this and the international tendency to increase the use of plants to

treat diseases, the latest scientific National Report of Medicinal Plants of Interest (Relação Nacional de Plantas Medicinais de Interesse), published by SUS, has 71 species (Brasil, 2009).

According to SUS, the production of phytotherapeutics involves multiples areas, for example, botany, ethnobotany, pharmacology, chemistry and phytochemistry, to validate results and use plants to treat diseases. In this case, botany mainly involves collecting herborization, identifying, classifying, incorporating specimens in herbaria, and studying the morphology and phytogeography of species (Maciel, et al., 2002; Oliveira & Ropke, 2016; Lima, et al., 2020).

This work provides morphological diagnoses of medicinal Lamiales species used in the municipality of Alta Floresta (MT). Photographs to help identify the plants and information about the phytogeography, medicinal uses in the municipality, results of preclinical trials and the status in the National Policy on Medicinal Plants and Phytotherapeutics are also provided for the species.

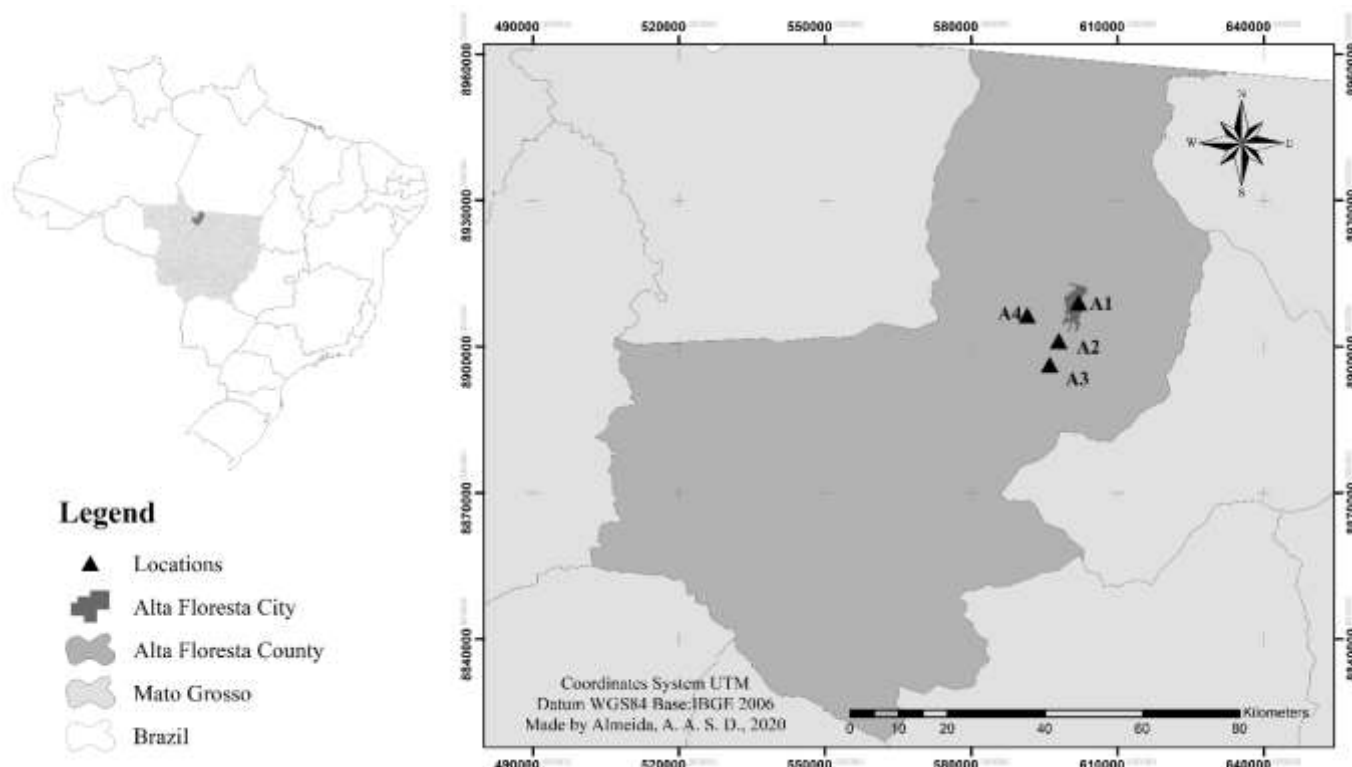
2. Methodology

The municipality of Alta Floresta is in the most northern part of Mato Grosso State (Figure 1a), Brazil. It is 8,947.07 km² and has a rainy, tropical climate with two defined seasons, a rainy summer and dry winter. The temperature ranges from 20° to 38 °C, rainfall averages are up to 2,750 mm per year, and it is at 283 meters elevation (PMAF, 2020). The population is estimated to be 51,959 inhabitants, with about 13% in rural areas, and the economy is based on agriculture, livestock, forest resources and ecotourism (IBGE, 2020; PMAF, 2020). The vegetation in the region is mainly open ombrophilous forest and deciduous and semideciduous seasonal forest in the Amazon biome (Zappi, et al., 2011).

The study is based on the medicinal plants in Fernandes (2002), which were recollected in the municipality of Alta Floresta between March and September 2020 (Figure 1b). Collections from the urban area were made in Parque Zoológico Leopoldo Linhares Fernandes, the neighborhoods of Cidade Alta, Bom Jesus, Sol Nascente, Jardim das Araras, Jardim Universitário and Novo Horizonte, as well as along the road Perimetral Rogério Silva, in a forest fragment and in various yards. In the rural areas, collections were made in the Central, São Bento and Guadalupe communities, from known properties. Additionally, one herbarium specimen (at HERBAM) and two images of specimens (at K, CEN) were used.

The entire plant or fertile branches were collected, photographed and processed using standard techniques for specimen herborization (Fidalgo & Bononi, 1989). Identifications were checked using taxonomic works, the spelling of scientific names and authors follows IPNI (2020), and the Angiosperm Phylogeny Group classification system was used (Stevens, 2021; APG, 2016). The geographic distribution in Brazil is based on BFG (2018), FB (2020) and REFLORA (2020). The specimens are in the Herbário da Amazônia Meridional (HERBAM) at the Universidade do Estado de Mato Grosso, Campus de Alta Floresta. The morphological descriptions were made in the Plant Morphology Laboratory, at HERBAM, using a stereomicroscope; the terminology was adapted from Radford et al. (1974) and Barroso et al. (1999). The reproductive structures of *Mentha pulegium* Linnaeus and *Rosmarinus officinalis* Linnaeus were described based on Franco and Afonso (1972) and Harley (1972). Literature was used to verify the medicinal uses in Alta Floresta (Fernandes, 2002), status of the species in the National Policy on Medicinal Plants and Phytotherapeutics, preclinical trials coordinated by the Ministry of Health (Brasil, 2006a, 2006b, 2006c; Brasil, 2009; Brasil, 2016; Brasil, 2019; Brasil, 2020) and examples of independent pharmacological trials.

Figure 1. Location of the municipality of Alta Floresta (MT), Brazil. Places with collections: A1 – urban area, A2 – Central Community, A3 – São Bento Community and A4 – Guadalupe Community.



Source: Authors.

3. Results and Discussion

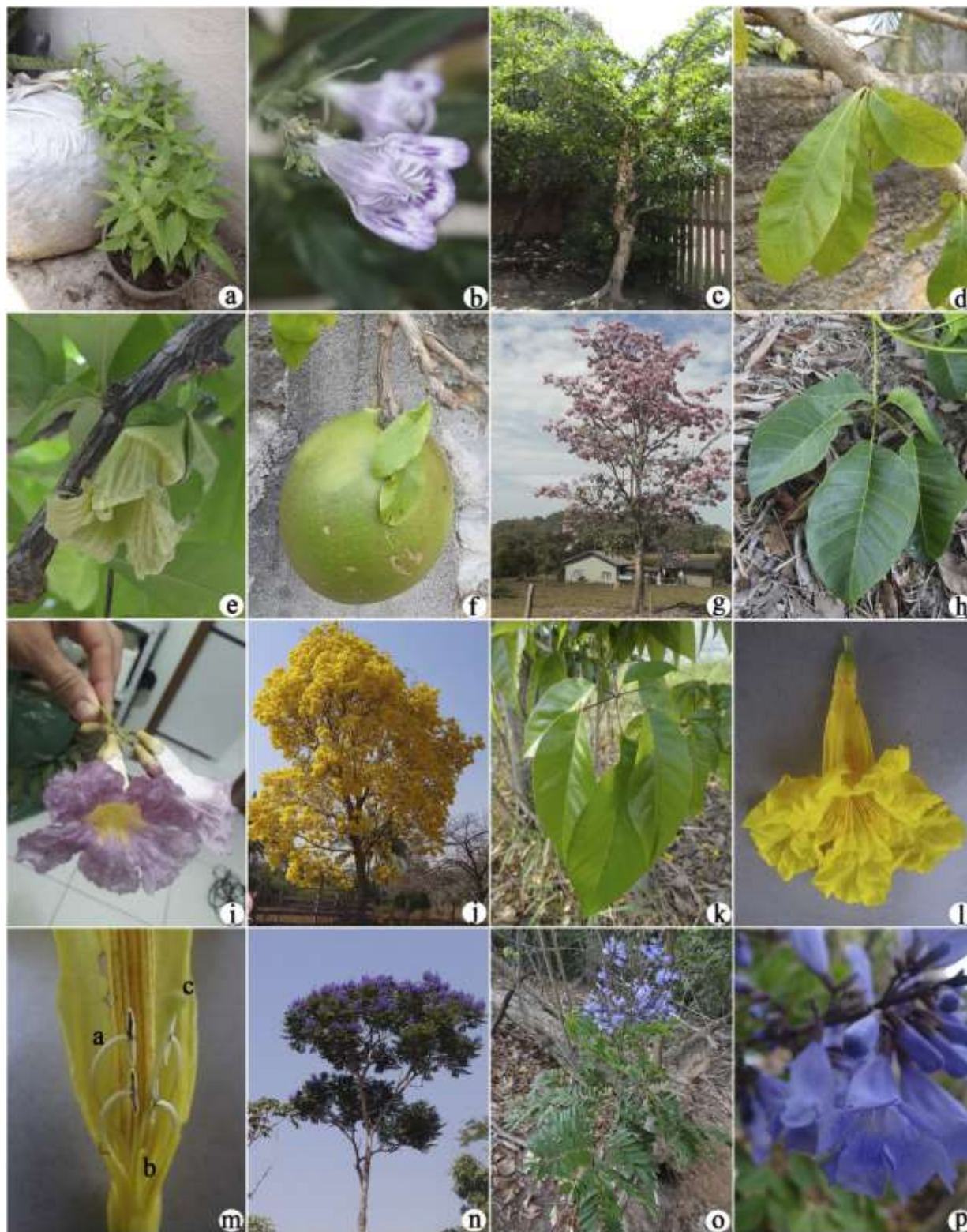
This work describes the morphology of 16 medicinal Lamiales species used in the municipality of Alta Floresta (MT), notably Lamiaceae (6 spp.), Bignoniaceae (4 spp.) and Plantaginaceae (3 spp.), followed by Verbenaceae (2 spp.) and Acanthaceae (1 sp.). For each species, the following is provided: a morphological diagnosis, with diagnostic characteristics related to habit, leaves, inflorescences, flowers, fruits and seeds; phytogeographic information; medicinal uses in Alta Floresta; information about pharmacological trials; and the status in the National Policy on Medicinal Plants and Phytotherapeutics (NPMPP).

Justicia pectoralis Jacq., Enum. Syst. Pl. 11. 1760. Acanthaceae. Common name: anador.

Figure 2a-b

Herbs, 25–38 cm tall. Leaves opposite, simple, petioles 1.2–2.8 mm long, blades 2.3–5 × 0.6–1.3 cm, narrow-lanceolate to lanceolate, base obtuse to acute, apex attenuate, adaxial and abaxial surfaces glabrescent, glandular trichomes absent. Inflorescences in panicles, units spiciform; flowers subsessile, zygomorphic; calyx with 5 sepals, these free, unequal, 1.8–2.5 mm long, linear, puberulent, glandular trichomes present; corolla 8.8–9 mm long, personate, puberulent, tube 5 mm long, whitish, upper lobe 2.8–3 mm long, lilac, lower lobe and 2 lateral lobes 3.8–4 mm long, lilac with white streaks on the palate; stamens 2, 2.5–2.8 mm long; ovary 1.1–1.2 mm long. Fruits capsule, 1–1.2 × 0.3 mm, narrowly ovate, ribbed. Vouchers: *J.M. Fernandes 1672* (HERBAM), *J.M. Fernandes 1727* (HERBAM).

Figure 2. Morphology of Lamiales species used in folk medicine in Alta Floresta (MT): *Justicia pectoralis* – a) habit, b) flowers; *Crescentia cujete* – c) habit, d) leaves, e) flower, f) fruit; *Tabebuia rosea* – g) habit, h) leaf, i) flower; *Handroanthus serratifolius* – j) habit, k) leaf, l) flower, m) flower inside (a= stamens, b= style and stigma, c= staminode); *Jacaranda copaia* – n) habit, o) branch with leaves and inflorescence, p) buttons and flower.



Source: J. M. Fernandes (a-p).

This species is native to Brazil, Cuba, Ecuador, Jamaica, Mexico, Trinidad and Venezuela (Oliveira & Andrade, 2000). In Brazil, it has been recorded in the North (AC, AM, PA, RO, RR), Northeast (AL, CE, MA, PB, PE, SE), Central-West (GO, MT, MS), Southeast (MG, RJ) and South regions (PR, SC), in the Amazon, Caatinga, Cerrado and Atlantic Forest biomes (Sartin, 2015; BFG, 2018). In the municipality of Alta Floresta (MT), it was collected in yards.

An infusion of the leaves is used to treat headaches and stomach problems and is very efficient at treating fevers (Fernandes, 2002). It is a species of interest in studies by SUS (BRASIL, 2009) and is included in the Brazilian Pharmacopeia, and the drug from the dried leaves should contain a minimum of 0.2% coumarin - $C_9H_6O_2$, molecular weight 146/15 g/mol (Brasil, 2019). However, it is not offered as a phytotherapeutic to SUS patients (Brasil, 2020).

Crescentia cujete L., Sp. Pl. 2: 626. 1753. Bignoniaceae. Common name: coité.

Figure 2c-f

Trees, 3–6 m tall. Leaves alternate, fasciculatiform, simple, sessile, blades 8–23 × 3.5–8 cm, narrowly obovate, rarely obovate, base attenuate, apex acute to obtuse, abaxial and adaxial surfaces glabrous to glabrescent, glands present, margins sinuous. Inflorescences cauliflorous; flowers 1–2, zygomorphic; calyx 2–2.4 × 1.8–2.4 cm, cracked, green, glabrous with glands externally; corolla 7–9 cm long, campanulate with lower transverse fold, glandular internally and externally, tube 4–5.5 × 3–3.5 cm, 5-lobed, 3–3.5 cm long, apex acuminate, venation slightly vinaceous; stamens 4, 3.7–4.6 cm long; ovary 4–6 mm long. Fruits anisarcid, 14–19 × 13–17 cm, widely elliptical, aromatic, densely glandular externally; seeds 8.5–10 × 6.2–7 mm, obovate, surrounded by white matter. Vouchers: *J.M. Fernandes 1724* (HERBAM), *J.M. Fernandes 1726* (HERBAM), *J.M. Fernandes 1725* (HERBAM).

The species was introduced to the Amazon Basin and Mexico; its natural distribution in Central America is not clearly understood (Gentry, 1980; Moreira, 2017). In Brazil, records of cultivated plants have been made in the North (AC, AM, AP, PA, RO, TO), Northeast (AL, BA, CE, MA), Central-West (DF, GO, MT) and Southeast regions (ES, MG, PA, RJ, SP), in the Amazon and Atlantic Forest biomes (BFG, 2018; REFLORA, 2020). In the municipality of Alta Floresta (MT), it was collected in urban yards.

An infusion of the leaves is used to treat coughs and hernias (Fernandes, 2002). It is not a species of interest to SUS (BRASIL, 2009) and is not in the Brazilian Pharmacopeia (BRASIL, 2019). However, in preclinical trials a 25% alcohol extract tested on rats helped heal wounds and scars, with fewer complications and early centripetal contraction of the lesions and, *in vitro*, exhibits *Escherichia coli*, *Staphylococcus aureus*, *Streptococcus* spp. and *Enterobacter* spp. inhibitory activity (Ramos, 2015).

Handroanthus serratifolius (Vahl) S.Grose, Syst. Bot. 32: 666. 2007. Bignoniaceae. Common name: ipê-amarelo.

Figure 2j-m

Trees, 5–16 m tall. Leaves opposite, palmate, petioles 5–9 cm, leaflets 4–7, blades 6–18.5 × 3–7.5 cm, elliptical to ovate, base acute to obtuse, apex acuminate, adaxial and abaxial surfaces glabrous, margin serrate. Inflorescences in panicles, terminal; flowers zygomorphic; calyx 1.3–1.6 cm long, campanulate, lobes 3–4; corolla 10.5–12 cm long, infundibuliform, yellow, 2 upper lobes 2–3.5 cm long, 2 lateral lobes and lower lobe 3–3.8 cm long, nectar guides clear; stamens 4, 1.9–2.6 cm long, staminode 1, 1.3–1.5 cm long; ovary 5–5.2 mm long. Fruits capsules, 24–36 × 1.2–1.7 cm, linear, subcylindrical, puberulent, glands sparse; seeds 1–1.3 × 3.5–4.2 cm, narrowly transverse-oblong, winged. Voucher: *J.M. Fernandes 1674* (HERBAM), *J. M. Fernandes 1722* (HERBAM).

This species is native from Colombia to Bolivia and from the Guianas to the Southeast Region of Brazil (Gentry, 1992). In Brazil, it occurs in the Distrito Federal and every state except Rio Grande do Sul and Santa Catarina (South Region),

in the Amazon, Caatinga, Cerrado, Atlantic Forest and Pantanal biomes (Gentry, 1992; BFG, 2018). In the municipality of Alta Floresta (MT), it was collected in native forest fragments in a rural zone and as a cultivated plant in an urban area.

A decoction of the inner bark is used to bathe wounds and is ingested to treat throat infections and to purify blood (Fernandes, 2002). The species is not of interest to SUS and is not in the Brazilian Pharmacopeia (Brasil, 2009; Brasil, 2019). However, it has been reported to reduce the parasite that causes leishmaniasis by up to 75.3% (*Leishmania amazonensis* and *Leishmania infantum*) when ethanol and lapachol extracts are used (Araújo, 2017; Costa, 2017).

Jacaranda copaia (Aublet) D. Don., Edinburgh Philos. J. 9(18): 267. 1823. Bignoniaceae. Common name: carobinha.

Figure 2n-p

Trees, 10–17 m tall. Leaves opposite, bipinnate, petioles 6.5–9 cm long, rachis 12–33 cm long, pinnae in 3–6 pairs, leaflets 7–21 per pinna, blades 3.2–8 × 1.3–3 cm, elliptical-rhomboid, base asymmetric, apex acuminate, rarely acute, adaxial and abaxial surfaces with sparse glandular trichomes, margin entire. Inflorescences in panicles, terminal, rachis 40–55 cm long; flowers pentamerous, zygomorphic; calyx 7–7.8 mm long, campanulate, greenish vinaceous, glandular trichomes dense, lobes 0.3–0.8 mm long; corolla 37–39 mm long, campanulate, externally puberulent, with sparse glandular trichomes, blue, 2 upper lobes, 2 lateral lobes and lower lobe 7–9 mm long; stamens 4, 12–14.7 mm long; ovary 1.7–1.8 mm long. Fruits capsules, 7.5–10 × 4.3–4.5, elliptical to elliptical-obovate, flattened, with straight margins, glabrous, rough. Voucher: *J.M. Fernandes 1708* (HERBAM), *C.R.A. Soares et al. 1834* (HERBAM).

This species is native from Belize to Bolivia and Brazil (Gentry, 1992). In Brazil, it occurs in the North (AC, AM, AP, PA, RO, RR), Northeast (MA) and Central-West regions (MT), in the Amazon biome (BFG, 2018). In the municipality of Alta Floresta (MT), it was collected in areas of seasonal semideciduous forest.

The bark and roots are prepared as a decoction used for kidney and rheumatic problems, throat and bladder infections, skin disorders and as a diuretic (Fernandes, 2002). It is not a species of scientific interest to SUS and is not in the Brazilian Pharmacopeia (Brasil, 2009; Brasil, 2019). Based on studies, ethanol and aqueous extracts of the leaves inhibit *Staphylococcus aureus* (Tapias & Armas, 2014).

Tabebuia rosea (Bertol.) Bertero ex A. DC., Prodr. 9: 215. 1845. Bignoniaceae. Common name: ipê-roxo.

Figure 2g-i

Trees, 6–12 m tall. Leaves opposite, palmate, petioles 3.1–17 cm long, leaflets 5, blades 7.5–27 × 3.8–15.5 cm, elliptical to ovate, base rounded, apex acute to caudate, abaxial and abaxial surfaces glabrous to lepidote, margin entire to sinuate. Inflorescences in panicles, congested, terminal; flowers zygomorphic; calyx 1.9–2.2 cm long, campanulate, lepidote, ferruginous, lobes 3–4, short; corolla 8.5–9.2 cm long, infundibuliform, purplish, tube internally yellowish to whitish yellow, 2 upper lobes 2–3 cm long, 2 lateral lobes and lower lobe 2.2–3 cm long, nectar guides evident; stamens 4, 1.9–2.6 cm long; ovary 9–10 mm long. Fruits capsules, 22–30 × 1.2–1.4 cm, linear, subcylindrical, lepidote; seeds, 0.8–1 × 3–3.5 cm, narrowly transverse-oblong, winged. Voucher: *J.M. Fernandes 1676* (HERBAM), *J. M. Fernandes 1723* (HERBAM).

The species is native from southern Mexico to Venezuela, including the coast of Ecuador, occurring in various habitats, especially in swampy forest, from sea level to 1200 meters of altitude; widely cultivated as an ornamental (Gentry, 1992). It is exotic to Brazil where there are records from the Central-West (DF, GO) and Southeast regions (ES, MG, RJ, SP), in the Cerrado and Atlantic Forest biomes (BFG, 2018).

In the municipality of Alta Floresta (MT), it was collected in urban and rural areas. A decoction of the bark is ingested as a tea to treat varicose veins, arthritis, ulcers, sinusitis, bronchitis, hemorrhoids and mouth sores (Fernandes, 2002). It is not on the list of interest by SUS or in the Brazilian Pharmacopeia (BRASIL, 2009; BRASIL, 2019). However, according to

Jimenez-Gonzalez et al. (2018), the *Tabebuia rosea* extracts have a promising antioxidant, anti-inflammatory, and antiproliferative activity, but future studies are required to isolate molecules responsible of these activities and to elucidate their mechanisms of action.

Leonotis nepetifolia (L.) R. Br., Hortus Kew. 3: 409. 1811. Lamiaceae. Common name: cordão-de-frade.

Figure 3a-b

Herbs, 0.6–1.5 m tall. Leaves simple, opposite, petioles 2.5–6 cm long, blades 6.5–10 × 4.5–7 cm, ovate, base attenuate to oblique, apex obtuse to rounded, adaxial and abaxial surfaces sericeous, glandular trichomes present, margin crenate. Inflorescences verticillasters, globular; flowers pedicellate, pedicels 1–1.2 mm long; flowers zygomorphic, tetramerous; calyx 16–18 mm long, curved, gamosepalous, sericeous, green, lobes 8–11, irregular, external glandular trichomes present; corolla 24–26 mm long, with very small lobes, densely covered by trichomes externally, orange, upper lobe villous to sericeous externally, margins velutinous, 2 lateral lobes and lower lobe glabrescent, curved; stamens 4, 8–11 mm long; ovary 1.3–1.5 mm long. Fruits nutlets, 2.8–3.1 × 1–1.2 mm, obovate. Vouchers: *J.M. Fernandes 1623* (HERBAM), *J.M. Fernandes 1731* (HERBAM), *J.M. Fernandes 1732* (HERBAM).

This species is native to Africa and exotic in other tropical regions of the world (Iwarsson & Harvey, 2003). In Brazil, it has been recorded in all of the regions and states as cultivated or naturalized (Iwarsson & Harvey, 2003; BFG, 2018). In the municipality of Alta Floresta (MT), it was collected in urban and rural yards.

The leaves and young stems are prepared as an infusion to treat fevers, rheumatism, urinary retention, uterine bleeding, asthma and upset stomachs, but has an abortive effect (Fernandes, 2002). The species was added to the list of plants of scientific interest to SUS in 1986 (Brasil, 2006c) but is not part of the Brazilian Pharmacopeia (Brasil, 2019). Preclinical research coordinated by SUS (Process nº 23946/86) demonstrated low toxicity via oral ingestion, pharmacological efficacy at treating bronchial asthma and spasmodic intestinal affections, and a lack of anti-inflammatory, antipyretic and diuretic activity (Brasil, 2006c).

Marsypianthes chamaedrys (Vahl) Kuntze, Revis. Gen. Pl. 2: 524. 1891. Lamiaceae. Common name: hortelã-do-campo.

Figure 3c-d

Herbs, 25–85 cm long, prostrate, xylopodium absent. Leaves opposite, simple, petioles 0.3–2 cm, blades 1.6–5 × 1.2–3 cm, ovate, base truncated to asymmetric, apex acute to obtuse, adaxial and abaxial surfaces with dense glandular trichomes, margin crenate to serrate. Inflorescences in cymes, axillary, congested, flowers 6–10 per unit; flowers zygomorphic, pentamerous; calyx 4.5–6.8 mm long, glandular trichomes dense, tube 3–4 mm long, urceolate, green, lobes 2–3 mm long, green to purple; corolla 7.5–9.8 mm long, tubular, tube 6–7 mm long, purplish white, internally sericeous, 2 upper lobes, 2 lateral lobes and lower lobe 1.5–2.8 mm long, purplish, glabrous; stamens 4, 0.8–2 mm long; ovary 0.8–1 mm long. Fruits nutlets, 2.1–3 × 1.8–2 mm, cymbiform, with convex dorsal surface, glabrous, brown. Vouchers: *J.M. Fernandes 1634* (HERBAM).

The species is native to Central and South America and, in Brazil, occurs in all the regions, states and biomes, except the Pampa (Hashimoto & Ferreira, 2020). In the municipality of Alta Floresta (MT), it was collected in rural yards and is often found in urban yards.

An infusion of the leaves is used to treat intestinal colic, diarrhea, nausea and as a dewormer (Fernandes, 2002). It is not on the list of interest by SUS or in the Brazilian Pharmacopeia (Brasil, 2009; Brasil, 2019). In an *in vitro* study, 100g of macerated leaves and inflorescences, as well as an infusion (2.5%), exhibited anti-inflammatory and anticoagulant mechanisms

under the effect of *Botrops atrox* venom; in the future, this species could contribute to treating snake bites (Magalhães, et al., 2011).

Mentha pulegium L., Sp. Pl. 2: 577. 1753. Lamiaceae. Common name: poejo.

Figure 3e-f

Herbs, 10–15 cm tall, prostrate, 15–60 cm long. Leaves opposite, simple, petioles 3–4.5 mm long, blades 4–13 × 7–10 mm, ovate, base slightly attenuate, apex obtuse to acute, adaxial and abaxial surfaces glabrescent, with sessile glandular trichomes, margin entire to dentate. Inflorescences verticillasters, globular, bracts foliate; flowers bisexual or pistillate, slightly bilabiate; calyx 2–5 mm long, campanulate to tubular, green, lobes 4–5, ciliate; corolla 4–6 mm long, tube shorter than the calyx, with 4 subequal lobes or 1 upper lobe, 2 lateral lobes and 1 lower lobe, lilac, long tector trichomes present externally; stamens 4, anthers 0–4 mm long; ovary 4-lobed. Fruits nutlets, 0–7.5 mm long, smooth, reticulate or tuberculate. Vouchers: R.F. Vieira 77 (photo K!).

This species is native to Europe, the Mediterranean, Northern Iran and Ethiopia and introduced in most other countries, especially those with a temperate climate (Harley, 1972). In Brazil, fertile specimens have been recorded in yards in the Northeast (BA, CE, RN), Central-West (DF, MS), Southeast (ES, MG, RJ, SP) and South regions (PR, SC, RS) (REFLORA, 2020). In the municipality of Alta Floresta (MT), it was collected in a yard but was not fertile. According to residents, the species never flowers and there are no specimens of it at HERBAM.

An infusion of the leaves is used to treat respiratory problems, menstruation, nausea, intestinal colic, intestinal gas, and for burping and intestinal colic of newborn babies (Fernandes, 2002). It is a species of interest to SUS (Brasil, 2009) but is not in the Brazilian Pharmacopeia (BRASIL, 2019). The essential oil of the species (70.66% pulegone, 11.21% neomenthol and 2.63% menthone) exhibits antioxidant activity and inhibits the enzyme butyrylcholinesterase, making it a candidate for therapies for cancer and Alzheimer's patients (Cheraif, et al., 2020).

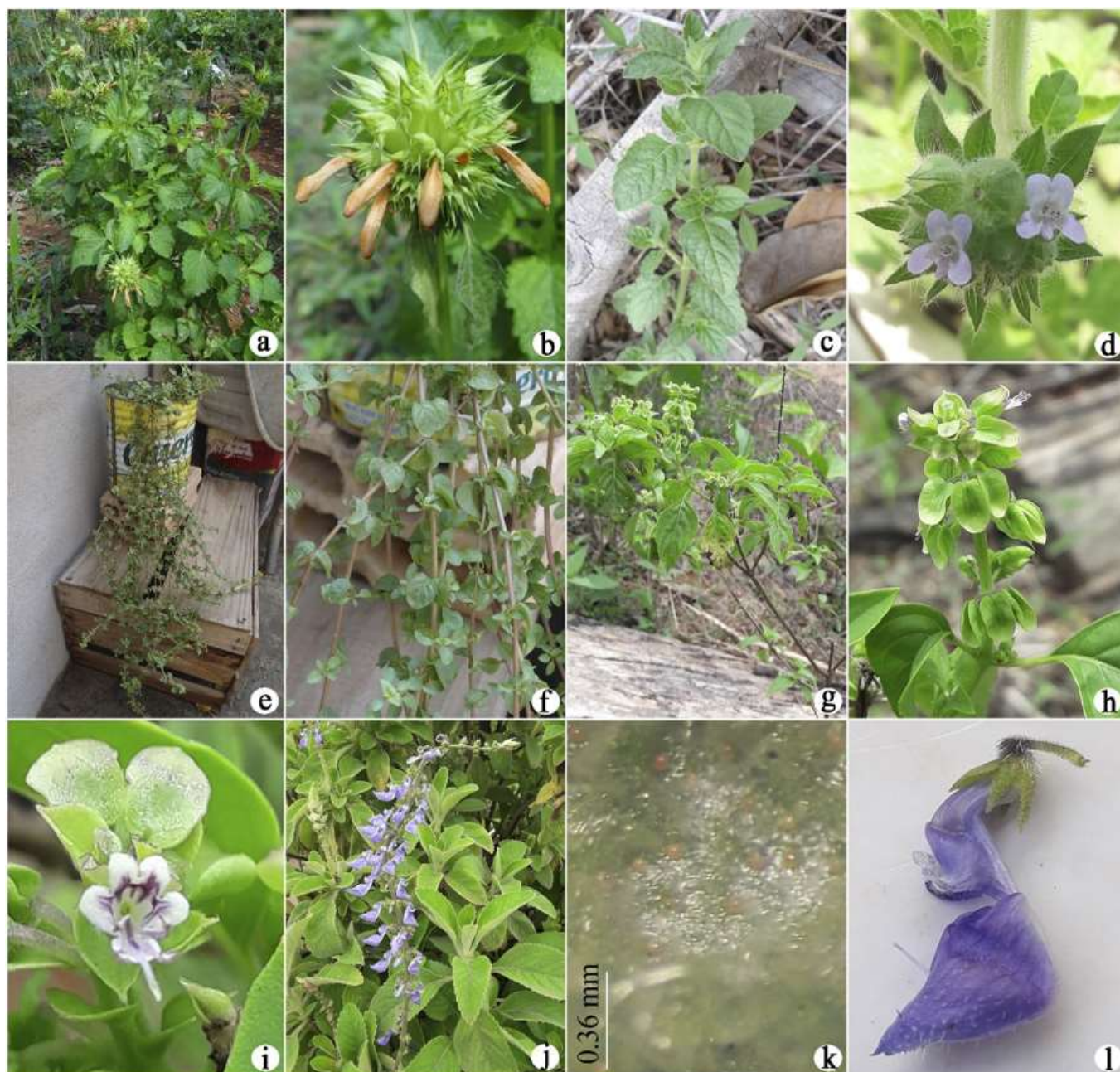
Ocimum campechianum Mill., Gard. Dict. (ed. 8) Ocimum no. 5. 1768. Lamiaceae. Common name: alfavaca.

Figure 3g-i

Herbs, 25–65 cm tall, xylopodium absent. Leaves opposite, simple, petioles 1.4–2.1 cm long, blades 4.2–6.5 × 3–4 cm, ovate, base and apex acute, adaxial surface with glandular trichomes, abaxial surface with glandular trichomes and sericeous veins, margin sparsely serrate. Inflorescences verticillasters, terminal, cymes in 3–9 pairs, with 3 flowers each; flowers pentamerous, bilabiate; calyx 6.1–7 mm long, tube 2–2.5 mm long, upper lobe 4.1–4.5 × 3.2–3.4 mm, orbicular, glandular trichomes present, margin short sericeous, 4 lower lobes 2.1–2.8 mm long, unequal, sericeous, glandular trichomes present; corolla 4.2–5 mm long, white-vinaceous, tube 2.2–2.6 mm long, upper lip 4-lobed, 1.1–1.2 × 0.8–1 mm, glabrescent, base vinaceous, lower lip 1-lobed, 2–2.4 × 1.7–2 mm, glabrescent, apex vinaceous; stamens 4, 3.4–3.9 mm long; ovary 0.7–0.8 mm long. Fruits nutlets, 1.6–2 × 1.1–1.3 mm, obovate, mucilaginous, rough. Vouchers: J.M. Fernandes 1625 (HERBAM), J.M. Fernandes 1736 (HERBAM).

This species is native from Florida (USA) and Mexico to northern Argentina (O'Leary, 2017). In Brazil, it is native and has been recorded in the North (AC, AM, PA, RR), Northeast (BA, CE, MA, PB, PE, PI), Central-West (DF, GO, MS), Southeast (ES, MG, RJ, SP) and South regions (PR, SC), in the Amazon, Caatinga, Cerrado and Atlantic Forest biomes (O'Leary, 2017; BFG, 2018). In the municipality of Alta Floresta (MT), it was collected in rural yards and is also common in urban areas.

Figure 3. Morphology of Lamiales species used in folk medicine in Alta Floresta (MT): *Leonotis nepetifolia* – a) habit, b) inflorescence; *Marsypianthes chamaedrys* – c) branch, d) inflorescence; *Mentha pulegium* – e) habit, f) branch; *Ocimum campechianum* – g) habit, h) inflorescência, i) flower; *Plectranthus barbatus* – j) habit, k) glandular trichomes, l) flower.



Source: J. M. Fernandes (a-l).

An infusion of the leaves is used to treat intestinal gas and respiratory problems, such as a cough, and as a diuretic and to help with digestion, while an infusion of the entire plant is used to treat high blood pressure and the seeds and roots are used to prepare an expectorant syrup (Fernandes, 2002). It is not a plant of interest to SUS and is not in the Brazilian Pharmacopeia (Brasil, 2009; Brasil, 2019). However, an experiment conducted *in vitro* suggests that a leaf infusion of the species is a potential source of antihyperglycemic agents and rosmarinic acid and methyl rosmarinate decreased glucose (Ruiz-Vargas, et al., 2019).

Plectranthus barbatus Andrews, Bot. Repos. 9: t. 594. 1809. Lamiaceae. Common name: boldo.

Figure 3j-1

Subshrubs, 0.5–1.5 m tall. Leaves opposite, simple, petioles 1.4–3 cm long, blades 7.5–13.5 × 4–7 cm, ovate to elliptical, base attenuate, apex obtuse, adaxial surface sericeous, with long tector trichomes, abaxial surface villous, with dense glandular trichomes, yellowish green, margin crenate to dentate. Inflorescences in verticillasters; flowers zygomorphic; calyx 4.8–7 mm long, campanulate, tube 1.8–2 mm long, upper lobe 4–5 mm long, ovate, 2 lateral lobes and 2 lower lobes 3–3.5 mm long, lanceolate to triangular; corolla 2.4–2.7 cm long, bilabiate, blue, glandular trichomes present, tube 1–1.1 cm long, strongly geniculate, 4 upper lobes 9–13 mm long, lower lobe 20–23 mm long, cymbiform; stamens 4, 5–8 mm long; ovary 1–1.5 mm long. Fruits nutlets, 0.9–1 × 0.5–0.6 mm, ellipsoid. Vouchers: *J.M. Fernandes 1596* (HERBAM), *J.M. Fernandes 1595* (HERBAM), *J.M. Fernandes 1606* (HERBAM).

This species is native to Ethiopia, Sudan, Tanzania and India (Codd, 1975). In Brazil, it is widely cultivated in yards (Lorenzi & Matos, 2008). In the municipality of Alta Floresta (MT), it was collected in urban and rural yards.

The macerated leaves are used to treat liver problems, indigestion, food toxicity and hangovers (Fernandes, 2002). It was added to the list of interest by SUS in 1986 and is on the last SUS list (Brasil, 2006c; Brasil, 2009) but is not part of the Brazilian Pharmacopeia (Brasil, 2019). In preclinical studies (Process n° 18545/87), an extract (0.1 to 1.0g/kg) resulted in decreased motility, drowsiness, ptosis and contortions, with normal data for subacute and chronic toxicity, but there is evidence that acute toxicity can cause abdominal contortions and decreased motility (Brasil, 2006c).

Rosmarinus officinalis L., Sp. Pl. 1: 23. 1753. (1 May 1753). Lamiaceae. Common name: alecrim.

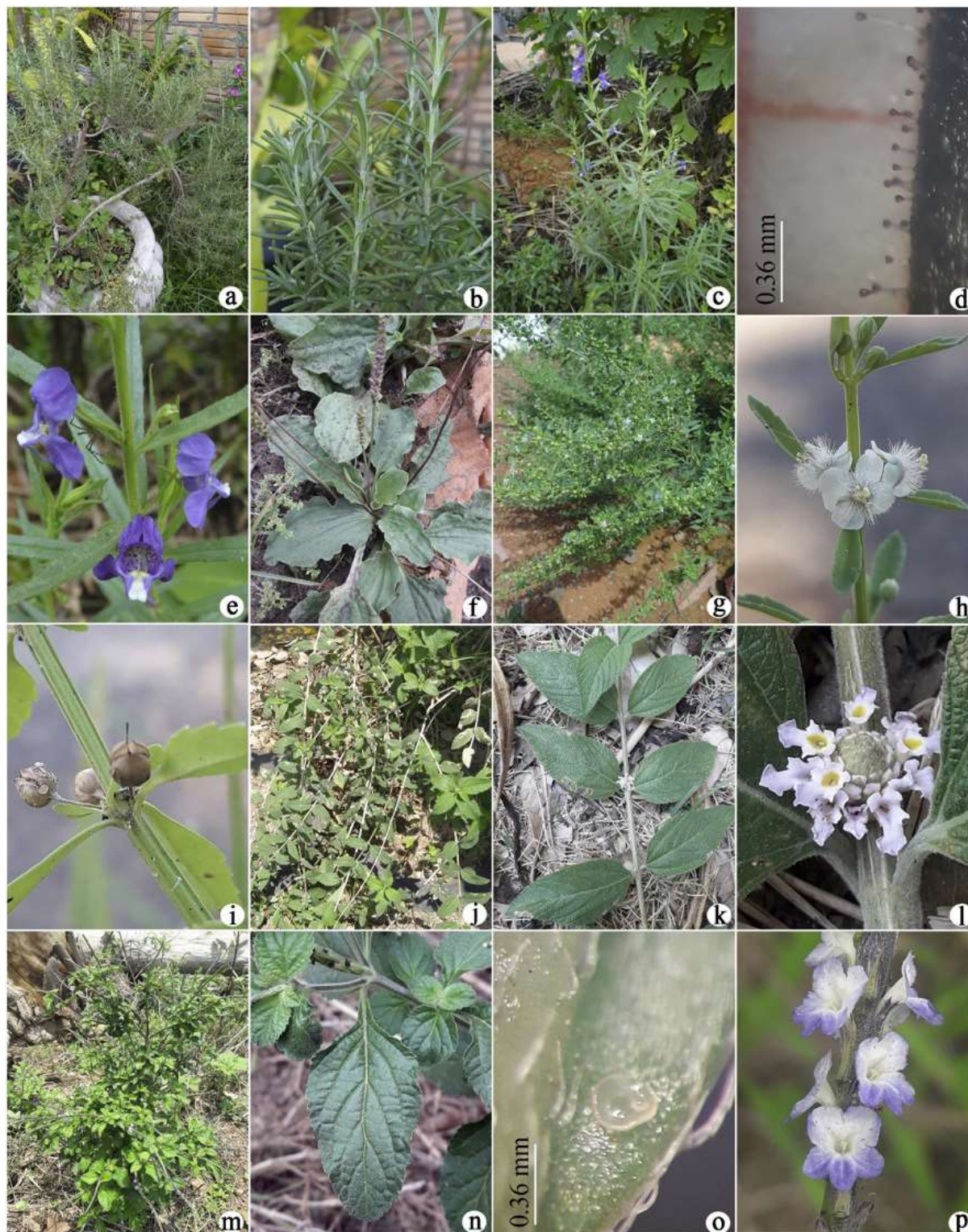
Figure 4a-b

Subshrubs, 40–60 cm tall. Leaves opposite, simple, sessile, blades 17–30 × 2–3 mm, linear, base cuneate, apex obtuse to rounded, adaxial surface glossy, sessile glandular trichomes capitate, sparse, stipitate glandular trichomes capitate, dense, abaxial surface densely villous, canescent, sessile glandular trichomes capitate, dense, coriaceous, margin entire. Inflorescences verticillastriform on the side branches, peduncle and pedicels tomentose, stellate trichomes present; flowers zygomorphic; calyx 5–7 mm long, campanulate, tomentose to glabrescent, green to purplish; corolla 10–12 mm long, light blue, rarely pink or white, 2 upper lobes concave, 2 lateral lobes and lower lobe cochleariform; stamens 2. Fruits nutlets. Voucher: *R.F. Vieira 85* (photo CEN!).

This species is native to the Mediterranean, Portugal and Spain and cultivated in other countries (Franco & Afonso, 1972). In Brazil, fertile plants have been collected in the Northeast (BA, CE, PB, RN), Central-West (DF, GO), Southeast (ES, MG, SP) and South regions (PR, RS, SC), where it is cultivated in yards (REFLORA, 2020). In the municipality of Alta Floresta (MT), collections of non-fertile plants were made in urban and rural yards, which were not deposited in HERBAM.

An infusion of the leaves is used to treat the nervous system, heart, menstruation and rheumatic pain (Fernandes, 2002). The species is not of interest in studies by SUS (Brasil, 2009) but a protocol to extract the volatile oil is in the Brazilian Pharmacopeia (Brasil, 2019). Data show that an aqueous extract exhibits significant *in vitro* antioxidant capacity that is attributed to the presence of phenolic compounds in its composition; when administered to rats at a concentration of 50mg/kg, it was efficient at mitigating oxidative stress caused by experimental diabetes (Silva, et al., 2011).

Figure 4. Morphology of Lamiales species used in folk medicine in Alta Floresta (MT): *Rosmarinus officinalis* – a) habit, b) branch; *Angelonia biflora* – c) habit, d) glandular trichomes, e) flowers; *Plantago major* – f) habit; *Scoparia dulcis* – g) habit, h) flowers, i) fruit; *Lippia alba* – j) habit, k) branch, l) inflorescence; *Stachytarpheta cayennensis* – m) habit, n) leaf, o) gland with drop of secretion, p) flowers.



Source: J. M. Fernandes (a-p).

Angelonia biflora Benth., Prodr. 10: 254. 1846. Plantaginaceae. Common name: alfazema.

Figure 4c-e

Herbs, 25–60 cm tall. Leaves opposite, simple, sessile, 3–9 × 0.3–0.5 cm, narrow-lanceolate, base sessile, apex acuminate, adaxial and abaxial surfaces with dense, stipitate glandular trichomes with a small head, margin sparsely serrate. Inflorescences in pairs or rarely solitary, axillary; pedicels 1.2–2 cm long; flowers showy, pentamerous, zygomorphic, bilabiate; calyx 2.8–5 × 1.8–2 mm, sepals free, green, glandular trichomes present; corolla 7.9–11 mm long, purplish, glandular trichomes present, tube 0.9–1 cm long, two pouches of oil present, rounded, elaiophore 3–4 × 2.8–3 mm, with dense glandular trichomes, greenish, bifid appendix present, ca. 2 mm long, 2 upper lobes 5–9 × 6–9 mm, obovate, 2 lateral lobes and lower lobe 7–10 × 5–7 mm, obovate; stamens 4, 4.6–5.2 mm long; ovary 1.2–1.4 mm long. Fruits capsules, 1 × 1 mm, globose.

Voucher: *J.M. Fernandes 1738* (HERBAM).

This species is endemic to Brazil, where it is native to the Northeast Region (CE, PB, PE, RN), in the Caatinga biome, and cultivated in the other regions (Souza & Giuliatti, 2009; BFG, 2018). In the municipality of Alta Floresta (MT), it was only collected on a rural property.

An infusion of the leaves is used to regulate menstruation and intestinal gas, as a sedative and for rheumatic pain, while a decoction of the entire plant is used to treat scabies and itches (Fernandes, 2002). It is not on the list of interest by SUS or in the Brazilian Pharmacopeia (Brasil, 2009; Brasil, 2019). No *in vitro* or preclinical studies were found for this species. However, according to Vanitha et al. (2014), in a study of an alcohol extract of the entire plant 33 types of phytochemicals were found, which might have therapeutic potential.

Plantago major L., Sp. Pl. 1: 112–113. 1753. Plantaginaceae. Common name: tansagem.

Figure 4f

Herbs, 20–40 cm tall. Leaves alternate, arranged in basal rosettes, simple, petioles 8–9.5 cm long, blades 8.5–13 × 8.5–11 cm, ovate, base truncate to slightly cuneate, apex obtuse to acute, adaxial and abaxial surfaces glabrous to sparsely hirsute, margins irregularly toothed, veins 5–7. Inflorescences in spikes, terminal, peduncle 23–26 cm long, rachis 7–20 cm long; flowers congested, tetramerous, actinomorphic; sepals 1.7–1.9 mm long, free, with translucent margins, glabrous; corolla 1.9–4.5 mm long, tube 1.2–1.5 × 0.7–0.8 mm, translucent, glabrous, lobes 0.7–0.9 mm long, narrowly triangular, glabrous; stamens 4, 2.4–2.7 mm long; ovary 0.7–0.8 mm long. Fruits pyxidia, 2.7–3 × 2–2.1 mm, operculum straw colored; seeds 11–17, 1–1.2 × 0.6–0.9 mm. Vouchers: *J.M. Fernandes 1721* (HERBAM), *J.M. Fernandes 1739* (BERBAM).

This species is native to Europe and introduced to other regions of the world (Cabrera & Zardini, 1978; Heffler, et al., 2011). In Brazil, it is naturalized or cultivated in the North (AC, PA), Northeast (BA, CE, PB, PE, RN), Central-West (DF, GO, MS, MT), Southeast (ES, MG, RJ, SP) and South regions (PR, RS, SC), in the Caatinga, Cerrado, Atlantic Forest and Pampa biomes (BFG, 2018). In the municipality of Alta Floresta (MT), it was collected in urban and rural yards.

The leaves and roots are prepared as an infusion that is used to treat throat and mouth inflammation, ulcers, acne and pimples, acting as a natural antibiotic, and a maceration of the leaves is used as a poultice on burns (Fernandes, 2002). The species was added to the list of interest by SUS in 1986 (Brasil, 2006c) but is not part of the Brazilian Pharmacopeia (BRASIL, 2019). Results from studies coordinated by SUS did not verify anti-inflammatory, analgesic and antipyretic action, but found that the species is not toxic (Brasil, 2006c).

Scoparia dulcis L., Sp. Pl. 1: 116. 1753. Plantaginaceae. Common name: vassourinha.

Figure 4g-i

Herbs or subshrubs, 30–60 cm tall. Leaves verticillate, simple, sessile, blades 0.5–2 × 0.2–0.9 cm, lanceolate to elliptical, rarely oblanceolate, base attenuate, apex acute, obtuse to rounded, adaxial and abaxial surfaces glabrous, main vein sparsely pubescent, glandular trichomes present in cavities, margin serrate. Inflorescences in pairs or solitary, axillary, peduncle 4–6 mm long; flowers tetramerous; sepals 1.8–2 mm long, free, green, glandular trichomes present; corolla rotate, tube 0.2–0.3 mm long, white, lobes 2.5–3 mm long, white to purplish, base internally villous, trichomes 1.8–2 mm long, white; stamens 4, 1.5–1.7 mm long, ovary 0.9–1 mm long. Fruits capsules, 2.1–2.3 × 2.1–2.3 mm, globose. Vouchers: *J.M. Fernandes 1608* (HERBAM), *J.M. Fernandes 1729* (HERBAM).

This species has a pantropical distribution, occurs in natural open areas, and is an invasive in crops (Souza & Giulietti, 2009). It is native to Brazil, where it occurs throughout the country (BFG, 2018). In the municipality of Alta Floresta (MT), it was collected on the edges of forests and in rural yards.

An infusion of the leaves and stems and a decoction of the stems are used to treat respiratory problems (e.g., bronchitis), fever, hemorrhoids and earaches, and to expel phlegm (Fernandes, 2002). The species was added to the list of interest by SUS in 1986 (BRASIL, 2006c) but is not part of the Brazilian Pharmacopeia (Brasil, 2019). There is little information related to pharmacological studies of this species, but an extract of the plant reduced sorbitol dehydrogenase (SDH) activity and decreased glycemia and glycosylated hemoglobin in diabetic rats (Latha & Pari, 2004).

Lippia alba (Mill.) N.E.Br. ex P. Wilson, Bot. Porto Rico 6(1): 141. 1925. Verbenaceae. Common name: erva cidreira.

Figure 4j-l

Shrubs, scandent, 0.6–1.5 m tall. Leaves opposite, simple, petioles 4–7 mm long, blades 10.5–12 × 4.5–5.5 cm, ovate to elliptical, base cuneate, apex acute to obtuse, adaxial and abaxial surfaces pubescent, glandular trichomes present, margins serrate. Inflorescences with capituliform units, solitary; peduncle 1.3–1.5 cm long; flowers sessile, zygomorphic; sepals 2, 1.3–1.5 mm long, united at the base, cymbiform, greenish, sericeous; corolla 6.5 mm long, hypocrateriform, pentamerous, tube 4 mm long, apex sericeous and lilac, fauce yellow, 2 upper lobes and 2 lateral lobes 2.5 mm long, triangular, lower lobe 3 mm long, unguiculiform; stamens 4, 0.3–0.4 mm long; ovary 0.8–1 mm long. Fruits schizocarps, mericarps 0.8–0.9 × 0.2–0.3 mm, narrowly obovate, smooth. Vouchers: *J.M. Fernandes 1615* (HERBAM), *J.M. Fernandes 1728* (HERBAM).

This species is native to Mexico, Central America, the Caribbean and South America (Moldenke, 1965). In Brazil, it occurs in the North (AC, AM, AP, PA, RO, RR, TO), Northeast (AL, BA, CE, MA, PB, PE, PI, RN, SE), Central-West (DF, GO, MS, MT), Southeast (ES, MG, RJ, SP) and South regions (PR, RS, SC), in the Amazon, Caatinga, Cerrado, Atlantic Forest and Pampa biomes (FB, 2020). In the municipality of Alta Floresta (MT), it was collected in yards.

An infusion of the leaves is used to treat stomach problems, intestinal gas and nervousness (Fernandes, 2002). It was added to the lists of interest by SUS in 1986 (BRASIL, 2006c). Preclinical studies (Technical Advice n° 012/87, Process n° 456/85) found the following for the species: a lack of significant activity at the central nervous system level; lack of hypnotic and anxiolytic activity; and, at elevated doses (200mg/kg), clear toxic effects were observed, suggesting this species should not be used for therapeutic purposes (Brasil, 2006c).

Stachytarpheta cayennensis (Rich.) Vahl, Enum. Pl. 1: 208. 1804. Verbenaceae. Common name: gervão.

Figure 4m-p

Subshrubs, 0.60–1.2 m tall. Leaves opposite, simple, sessile, blades 2.5–6.5 × 1.4–2.9 cm, ovate, apex acute, base attenuate, adaxial and abaxial surfaces villous to sericeous, sparse glands present at the base of the abaxial surface, margin

crenate-serrate. Inflorescences spikes, terminal, rachis 10–19 cm long; flowers zygomorphic, pentamerous; calyx 4.3–5 × 1 mm, green-vinaceous, sparsely sericeous to sparsely villous, glands 3–6, embedded in the rachis, upper lip lobe 0.2–0.3 mm long, greenish, 4 lobes on lower lip 0.5–0.8 mm long, vinaceous; corolla 7–7.3 mm long, hypocrateriform, glabrous externally, tube white, lobes lilac, 2 upper lobes 2 × 2–3 mm, 2 lateral lobes and lower lobe 1.4–1.7 × 1.3–2 mm; fertile stamens 2, basal, 1.8–2 mm long; ovary 1.2–1.4 mm long. Fruits schizocarps, mericarps 3.5–4 × 1.3–1.6 mm long, outer surface reticulate, blackened. Vouchers: *J.M. Fernandes 1624* (HERBAM); *J.M. Fernandes 1733* (HERBAM), *J.M. Fernandes 1734* (HERBAM).

This species is native from Central American and the Caribbean to South America, until Argentina, and is widely naturalized in all tropical and subtropical regions of the world (Atkins, 2005). In Brazil, Alagoas, Piauí and Rio Grande do Norte (Northeast Region) are the only states where it does not occur; it is found in the Amazon, Caatinga, Cerrado, Atlantic Forest, Pampa and Pantanal biomes (BFG, 2018). In the municipality of Alta Floresta (MT), it was collected in rural yards and an anthropic area.

This species is used as a stimulant, febrifuge and diuretic, to sweat, and to treat urinary problems, chest, stomach and liver pain, constipation and hepatitis (Fernandes, 2002). It was added to the list of interest by SUS in 1986 but is not in the Brazilian Pharmacopeia (Brasil, 2006c; Brasil, 2019). Preclinical research (Process nº 08443/88) coordinated by SUS showed pharmacological effects, central antialgic and antiedematogenic activity, but no antispasmodic activity (Brasil, 2006c). It is not among the phytotherapeutics medicines offered by SUS (Brasil, 2020).

4. Conclusion

Most of the Lamiales species in this study are native to and have a wide distribution in Brazil that, combined with popular knowledge, can facilitate preclinical and clinical trials.

During the morphological study of the fresh samples, glandular trichomes on the leaves and/or flowers were observed on almost all of the species, which are an important source of secondary compounds and indicative of possible new phytotherapeutics. It is sometimes difficult to observe these structures on dried specimens. Thus, when conducting morphological and/or taxonomic studies of herbarium specimens, it is suggested to rehydrate leaves and other structures so glandular trichomes can be observed.

Due to the relevance of Lamiales species in Brazil and popular medicine, as well as in the examples of the trials presented in this work, the Ministry of Health has consistent justifications to intensify its National Policy on Medicinal Plants and Phytotherapeutics, with the goal of increasing its phytotherapeutic options in the National Report of Essential Medicines provided to SUS users that seek non-conventional treatments.

Additionally, the importance of taxonomic works to medicinal plant studies is evident, since they help with identification and understanding morphology that are the basis for interdisciplinary studies that search for new phytotherapeutics. New works with the same profile are needed, as way to show and draw the attention of the Ministry of Health on the potential of brazilian biodiversity.

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