

MÜGGE, FLB; PAULA-SOUZA, J; MELO, JC; BRANDÃO, MGL. 2016. Native plant species with economic value from Minas Gerais and Goiás: a discussion on the currentness of the data recovered by the French naturalist Auguste de Saint-Hilaire. *Horticultura Brasileira* 34: 455-462. DOI - <http://dx.doi.org/10.1590/S0102-053620160402>

Native plant species with economic value from Minas Gerais and Goiás: a discussion on the currentness of the data recovered by the French naturalist Auguste de Saint-Hilaire

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ABSTRACT

Given the increasing anthropic threats faced by natural ecosystems all around the world, this work holds an important role by recovering primary information of the Brazilian biodiversity. In this study we discuss data collected at a time when the native vegetation in Brazil was still preserved, and the use of plants was primarily made from species of autoctone flora. Those areas were visited by European naturalists in the 19th century, including the French Auguste de Saint-Hilaire, who described the use of numerous native species. The possibility of current economic use of some species cited by him in the 19th century is discussed.

Keywords: Biodiversity, traditional uses.

RESUMO

Espécies de plantas nativas de Minas Gerais e Goiás com valor econômico: uma discussão sobre a atualidade das informações coletadas pelo naturalista francês Auguste de Saint-Hilaire.

Face às crescentes ameaças antrópicas enfrentadas pelos ecossistemas naturais em todo o mundo, este trabalho tem um papel importante, recuperando informações primárias da biodiversidade brasileira. Neste estudo, são discutidas informações coletadas em um tempo em que a vegetação nativa no Brasil ainda estava preservada e o uso das plantas era feito principalmente a partir de espécies da flora autóctone. Estas áreas foram visitadas por naturalistas europeus no século XIX, incluindo o francês Auguste de Saint-Hilaire, que descreveu o uso de numerosas espécies nativas. Neste trabalho, discute-se a possibilidade real de utilização econômica de algumas espécies citadas por ele no século XIX.

Palavras-chave: Biodiversidade, uso tradicional.

(Recebido para publicação em 16 de março de 2016; aceito em 12 de setembro de 2016)
(Received on March 16, 2016; accepted on September 12, 2016)

Brazil is home to one of the richest floras in the world, consisting of over 45,000 plant species (BFG, 2015; Flora do Brasil 2020, 2016), which represents roughly 10% of the world's total. The Atlantic Forest and the Cerrado are known for their high biodiversity rates and levels of endemism, which, combined with their critical risks of degradation, have granted them the status of Biodiversity Hotspots. The remaining Brazilian Biomes (Caatinga, Pantanal, Pampas and Amazonia) are nevertheless equally relevant in terms of biological diversity.

Different ecosystems produce a large variety of substances with different chemical structures, which can be useful for the development of cosmetics, medicines and nutraceuticals, among other products. This characteristic gives Brazil an enormous biotechnological potential. In fact, many examples of

substances used in medical systems today are produced out of Brazilian flora, accessed through ancient Amerindian knowledge. One of them is pilocarpine, extracted from "jaborandi" leaves (*Pilocarpus* spp.), used for decades in the treatment of glaucoma. Other example is tubocurarine, extracted from *Chondrodendron tomentosum* Ruiz & Pav. ("curare") and used as an adjuvant in anesthesia, due its relaxing effect over the skeletal musculature. A third example is emetine, a potent amoebicide and emetic obtained from roots of "ipecaquanha" (*Carapichea ipecacuanha* (Brot.) L.Andersson) and used in the treatment of diarrhea and poisonings (Nogueira *et al.*, 2010). Other examples of natural substances from Brazilian plants which have been exploited more recently are alpha-bisabolol and quercetin. The first substance is a potent anti-inflammatory

found in the essential oil from the wood of *Eremanthus erythropappus* (DC.) MacLeish ("candeia"), while the flavonoid quercetin is obtained from fruits of the *Dimorphandra mollis* Benth. ("favela").

Despite this richness, Brazilian native vegetation has suffered a continuous destruction process, since the arrival of the Portuguese in 1500. The Atlantic Rainforest for example, is considered the most threatened tropical forest in the world, since it had nearly 96% of its original area already devastated (Ab' Sáber, 2003). However, the expansion of farming and grazing activities, as well as unplanned mining, has been pushing even on the other ecosystems (Nepstad *et al.*, 2014). Accessing the potential of native useful plants in Brazil becomes strategic and needs to be prioritized, since they are still very poorly known and its potential

is still insufficiently exploited, which is further aggravated by the fact that these species are very often distributed in areas subjected to intense human action and therefore under severe threat of extinction.

The World Health Organization (WHO) recognizes the importance of plants to promote public health in the world, and since the 1970's it has encouraged validation studies. Validating a plant means determining its safety and effectiveness by laboratory essays, and enabling their transformation into products for collective use (WHO 2010). Since 2002, the WHO began also to encourage the studies of plants used in ancient medical systems, such as those used by Amerindians in past centuries, including the Brazilian native populations. In order to contribute with these recommendations, since 2004 our research group is developing a series of studies with the objective of recovering historical data about Brazilian plants, especially those collected by European naturalists who travelled in Brazil during the 19th century (Brandão *et al.*, 2011, 2012; Breitbach *et al.*, 2013; Fagg *et al.*, 2015), among other authors (Chaves *et al.*, 2015). Besides recovering the historical data, our group has also been searching the plants in the field as well. The French botanist Auguste de Saint-Hilaire is certainly among the most important naturalists that registered the use of Brazilian plants. In 2016, we are celebrating the 200th anniversary of his arrival in Brazil. As part of these celebrations, in this study we present data about some plants with economic value registered by him in Minas Gerais and Goiás and discuss the possibilities of their current economic exploitation.

Economic uses for plants from Minas Gerais and Goiás

Much information on plant species used by Amerindians was compiled by the Spanish and Portuguese in the early colonization of the continent. In the 17th century, the Dutch Willem Piso lived for eight years in the Brazilian Northeastern coast, and recorded his observations in the book *Historiae Naturalis & Medicae*, published in 1648 (Piso, 1648). Piso's work described the plants used by Amerindians at the time,

and it was the only source of information on the biodiversity of South America until the late 18th century, when the continent was opened to expeditions of other European naturalists. The pioneer was the German Alexander von Humboldt, who explored the area now occupied by Venezuela, Guyana and the Brazilian states of Amapá and Roraima, from 1799 to 1804. Throughout the 19th century, dozens of other scientists from different parts of Europe traveled to South America, especially Brazil, describing the flora, fauna, mineral resources and local customs. The contribution of these naturalists to the knowledge of South American biodiversity is immeasurable: a whole new biological universe unknown to science was uncovered, and thousands of new genera and species have been described, based on the materials they collected. The biological collections and bibliographical records gathered by these naturalists represent a precious and strategic heritage, which enormously contribute to the knowledge of the natural history of the Americas and the consequent development of the region.

More than three hundred useful and medicinal species were recorded by Saint-Hilaire in his field notebooks (Brandão *et al.*, 2012) and 70 of them, considered by him as priority for use, were described in his book *Plantes Usuelles des Brésiliens*, published in 1824, but translated to Portuguese only in 2014. From these, the uses of many species were registered while travelling in Minas Gerais and Goiás (Figure 1). These historical records are important because they are primary, i.e., they were collected in a time when the native vegetation was still relatively intact and the Brazilian population used almost exclusively species from the Brazilian biodiversity. This situation is currently very different, since the exotic introduced species are the most known and used as remedies and food.

The idea of sustainable development was already signaled by Saint-Hilaire. In several parts of his work, he drew attention to the destruction of the native vegetation, already massively occurring at that time. He also warns the Brazilians for the need to perform scientific studies

with their native plants, in order to know their efficacy and security and to produce commercial products to preserve them and to generate income for the population.

In the last six years we have done a field work following Saint-Hilaire's routes. In these paths, we found 33 species cited in *Plantes Usuelles des Brésiliens* that today could be better used and potentially generate income (Table 1). In order to verify the possibilities of their use in short, medium and long term, we have classified these species in four categories (I, II, III and IV), promoting a ranking that we hope will contribute to indicate research priorities, optimize and systematize their use, according to their particularities. In each category the plants received a grade from 1 to 4, as follows:

Category I: plants were ranked by their type of use. Species that can be immediately commercialized received 4, while species used as food were aggregated in grade 3. Species used as cosmetics and medicine received lower grades, respectively 2 and 1. The downgrading comes from the need of submitting products from these species to efficacy and security studies prior to their delivery to the market, which demands time and investments.

Category II: plants were ranked considering the impact of the extracted part on the specimen's development/survival. Plants whose fruits are used received grade 4. They were followed by plants whose leaves (3), exudates (2) and roots/barks (1) are used.

Category III: we considered plant distribution along the cities Saint-Hilaire visited (Figure 1). Species found in more than four cities received grade 4, those found in three areas received grade 3 and so on.

Category IV: we ranked the plants by the availability of any scientific study about them. Species that were submitted to a study to test the traditional use based on the same parts described by Saint-Hilaire received grade 4. Species that had the same traditional use tested in laboratory studies, but with different parts of the plant in relation to Saint-Hilaire's description, received grade

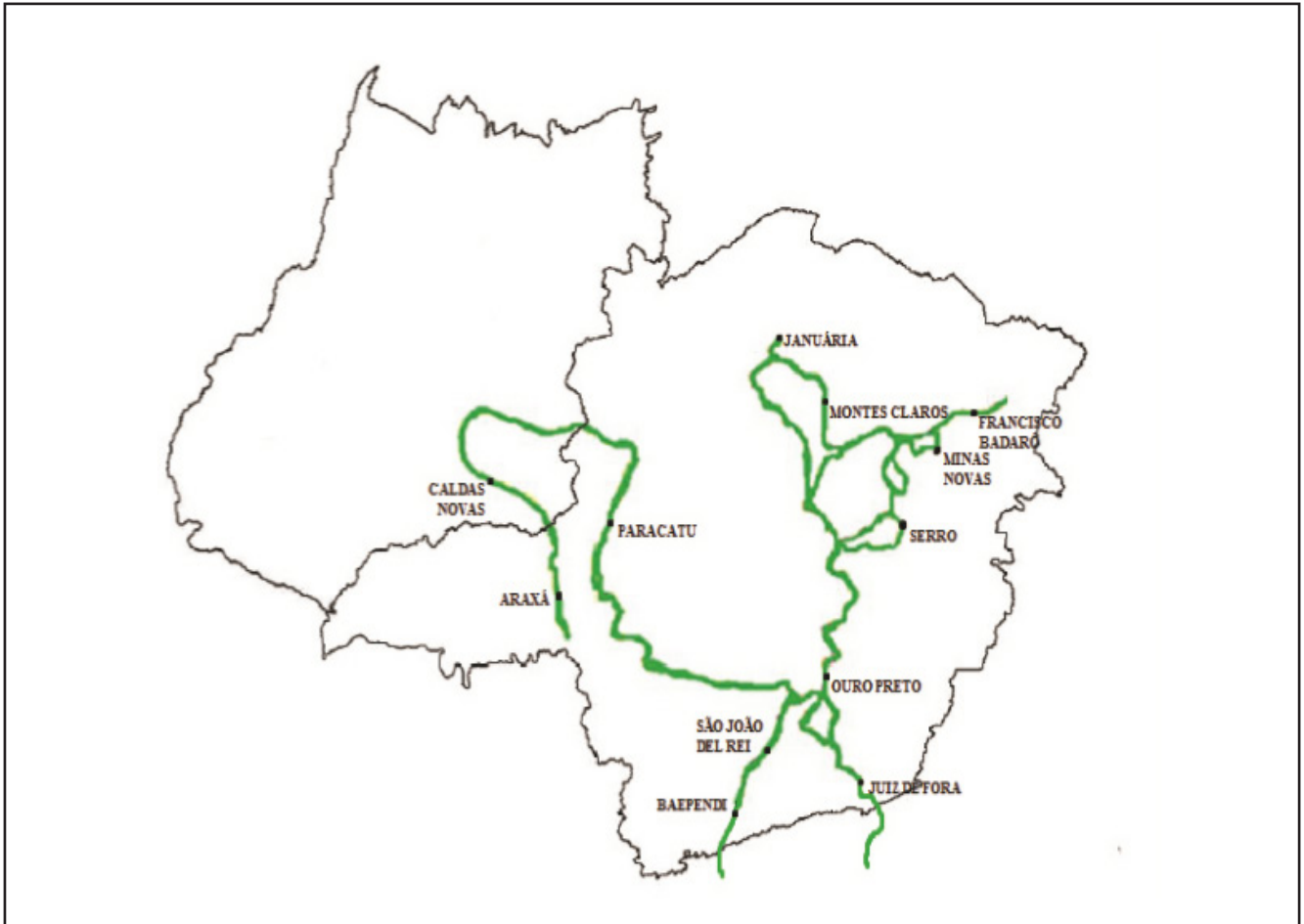


Figure 1. Path traversed and redone by Auguste de Saint-Hilaire in Minas Gerais and Goiás from 1816 to 1822 (caminho percorrido e refeito por Auguste de Saint-Hilaire em Minas Gerais e Goiás, de 1816 a 1822). Belo Horizonte, UFMG, 2016.

3. Grade 2 (the same part of the plant) and 1 (other part) were given to species submitted to other types of laboratory studies that do not relate to any of Saint-Hilaire's description of uses of those plants.

A final score considering the grades in each of the four categories was then produced for each of the 33 species (Table 1). Fruits of *Xylopia sericea* A.St.-Hil. received the highest grade (16). *X. sericea* and the similar species *X. aromatica* are one of the most common trees in the Cerrado, being actually found in all the paths visited by Saint-Hilaire in Minas Gerais and Goiás (Figure 1). It is popularly known as “embira”, “pindaíba” or “pimenta-de-macaco” (“monkey pepper”). Fruits were described by Saint-Hilaire as similar to black pepper (*Piper nigrum* L., pimenta-do-reino), but better than those, as he considered *Xylopia* fruits softer and more aromatic. They are still

currently used as spice in some places. In main cities of North Minas Gerais, as Januária and Montes Claros for example, it is possible to find the dried fruits in the popular market.

Xylopia species are examples of plants with current potential market as spice and we argue that they should be better known and explored. Recent studies by Oliveira *et al.* (2014) show the potential of *X. aromatica* as functional food. Fruits were effective in modulating metabolic abnormalities associated with obesity, especially those related to glucose metabolism. The beneficial effects of modulation may be associated with a reduced release of inflammatory mediators in adipose and hepatic tissues. Anticancer activity of *Xylopia aromatica* (Lam.) Mart. was also observed in many studies. Acetogenins extracted from plant stem demonstrated cytotoxicity comparable to adriamycin on three lines of solid

cancers in humans. Other substances showed cytotoxic activity in cancer cell lines (Fournier *et al.*, 1994; Colman-Saizarbitoria *et al.*, 1995; Suffredini *et al.*, 2007). These results showed also a future potential of the plant for the development of new medicines.

Other edible fruits achieved high grades in this study, such as *Annona sylvatica* A.St.-Hil. (15), *Talisia esculenta* (Cambess.) Radlk. (“pitombeira”, 12), *Allophylus edulis* (A.St.-Hil. et al.) Hieron. ex Niederl. (“fruta-de-parão”, 11), *Guazuma ulmifolia* Lam. (“mutambo”, 11), *Sterculia apetala* (Jacq.) H.Karst. (“chichá”, 10) and *Strychnos pseudoquina* A.St.-Hil. (“quina-do-campo”, 10). All these species are well known and used by the populations of rural areas of Minas Gerais and Goiás, but their market is still restricted. Tropical ecosystems are very rich in edible fruits and several of them were

Table 1. Useful plants registered by Auguste de Saint-Hilaire (1824) in Minas Gerais and Goiás in his book “Useful Plants from Brazilians” (Plantas úteis registradas por Auguste de Saint-Hilaire (1824) em Minas Gerais e Goiás, em seu livro “Plantas Usuais dos Brasileiros”). Belo Horizonte, UFMG, 2016.

Scientific name ¹ / Family / Vernacular name / Used parts	Collecting sites registered by Saint-Hilaire	Traditional uses by Saint-Hilaire	I	II	III	IV	total
<i>Xylopiya sericea</i> A.St.-Hil. / Annonaceae / Pimenta-de-macaco / Fruits	Many sites of Brazil	Spice	4	4	4	4	16
<i>Annona sylvatica</i> A.St.-Hil. / Annonaceae / Araticu-do-mato / Fruits	This tree grows in the woods of Minas Province	Edible fruits	3	4	4	4	15
<i>Chorisia speciosa</i> A.St.-Hil. (= <i>Ceiba speciosa</i> (A.St.-Hil.) Ravenna) / Malvaceae / Árvore-da-paina / Fibers	In the forests of Minas Province, as well as in the fields around the town of Barbacena	The white fibers where the seeds are enclosed are used to manufacture pillows and cushions	4	4	2	4	14
<i>Davilla rugosa</i> Poir. / Dilleniaceae / Cipó-de-Carijó, Sambaibinha / Leaves	From the Eastern border of Minas Province to the limits of Santa Catarina	Astringent; against leg and testicle oedemas	1	3	4	4	12
<i>Sapindus esculentus</i> Cambess. (= <i>Talisia esculenta</i> (Cambess.) Radlk.) / Sapindaceae / Pitombeira / Fruits	This tree is common in the desert part of Minas Province, called Sertão of São Francisco River	The edible fruit called “pitomba” is fleshy and enjoyed by the inhabitants of the Sertão	3	4	3	2	12
<i>Verbena jamaicensis</i> L. (= <i>Stachytarpheta jamaicensis</i> (L.) Vahl) / Verbenaceae / Gervão, Urgevão, Orgibão / Leaves	Abundant in almost every warm parts of Brazil, especially those once covered by forests	Analgesic, stimulant, febrifuge, vulnerary	1	3	4	4	12
<i>Allophylus edulis</i> (A.St.-Hil. et al.) Hieron. ex Niederl. / Sapindaceae / Fruta-de-Parão / Fruits	Woods near Contendas, a village in the desert of São Francisco River, in the Province of Minas	Fruits have a sweet and pleasant taste	3	4	0	4	11
<i>Guazuma ulmifolia</i> Lam. / Malvaceae / Mutambo, Mutombo / Fruits	In the Western part of Minas Province, called Sertão of S. Francisco River; many sites in the desert of S. Francisco River	Fruits rich in mucilage, having a sweet and pleasant taste.	3	4	4	0	11
<i>Erythroxylum suberosum</i> A.St.-Hil. / Erythroxylaceae / Galinha-choca, Mercúrio-do-campo/ Barks	<i>Carrascos</i> , near Piedade (Minas Novas) and in the fields near Canoas and Corgo do Matias, in the Sertão of Minas Province	A tawny ink is obtained from the bark of this plant, which is said to be firm	4	1	3	2	10
<i>Luehea paniculata</i> Mart. & Zucc. / Malvaceae / Açoita-cavalo / Barks	Desert of S. Francisco River, not far from the village called Pé do Morro	Leather processing	4	1	3	2	10
<i>Sterculia chicha</i> A.St.-Hil. (= <i>Sterculia apetala</i> (Jacq.) H.Karst.) / Malvaceae / Chichá / Flowers, seeds and fruits	This beautiful tree grows in the Province of Goiás.	Edible seeds and fruits; ornamentation	3	4	3	0	10
<i>Strychnos pseudoquina</i> A.St.-Hil. / Loganiaceae / Quina-do-campo/ berries and barks	Eastern part of Minas Gerais Province (Sertão or desert), district of Minas Novas and the Diamond’s, in the deserts of Goiás	The sweet berries serve as food; the rind has an efficient property against intermittent fevers	3	4	3	0	10
<i>Cissampelos ovalifolia</i> DC. / Menispermaceae/ Orelha-de-onça/ Roots	Goiás, and Western Minas Province, especially near the town of Paracatu	Decoction of bitter roots against intermittent fevers	1	1	3	4	9
<i>Cochlospermum regium</i> (Mart. ex Schrank) Pilger / Bixaceae / Butua-do-curvo / Roots	Fields of the Sertão, near Paracatu, Riachara, Formigas, etc., <i>Caatingas</i> near the military post, named Quartel de Teixeira, Minas Novas	Analgesic	1	1	4	3	9
<i>Curatella cambaiba</i> A.St.-Hil. (= <i>Curatella americana</i> L.) / Dilleniaceae / Sambaíba / Barks	Minas Province, the region called Sertão	Wound asepis due to astringent properties	1	1	3	4	9
<i>Kielmeyera speciosa</i> A. St.-Hil. / Calophyllaceae / Malva-do-campo, Folha-santa / Leaves	<i>Tabuleiros cobertos</i> , in the Southern part of Minas Province	Emollient baths	2	3	3	1	9

Table 1. Continuation

Scientific name ¹ / Family / Vernacular name / Used parts	Collecting sites registered by Saint-Hilaire	Traditional uses by Saint-Hilaire	I	II	III	IV	total
<i>Chinchona ferruginea</i> A.St.-Hil., <i>C. vellozii</i> A.St.-Hil., <i>C. remijiana</i> A.St.-Hil. (= <i>Remijia ferruginea</i> (A.St.-Hil.) DC.) / Rubiaceae / Quina-da-Serra, Quina-de-Remijo / Barks	Vicinity of São João del Rei, in the surroundings of Villa-Rica, in Serra dos Pilões near S. Miguel do Mato Dentro, Penha, with the name of Minas Novas, etc	Febrifuge properties	1	1	2	4	8
<i>Drimys granadensis</i> L.f. ² / Winteraceae / Casca-d'anta / Leaves and barks	This plant is found in many parts of Brazil; it is especially common in Minas Province	Tonic to heal colics and stomach ailments	1	3	1	3	8
<i>Evodia febrifuga</i> A.St.-Hil. (= <i>Esenbeckia febrifuga</i> (A.St.-Hil.) A. Juss. ex Mart.) / Rutaceae / Três-folhas-vermelhas, Laranjeira-do-mato, Quina / Barks	This tree grows in the elevated forests of Minas Province, particularly near Itabira do Mato Dentro	The bark and wood are used as febrifuge	1	1	2	4	8
<i>Maprounea brasiliensis</i> A.St.-Hil. / Euphorbiaceae/ Marmeleiro-do-campo / Leaves	Surroundings of Porto de Quebra Anzol, in Minas Gerais Province, and in Minas Novas, near Fazenda de Culão where it usually grows in low forests called <i>carrascos</i>	Dyeing of cotton fabric	4	3	1	0	8
<i>Davilla elliptica</i> A.St.-Hil. / Dilleniaceae / Sambaibinha / Leaves	District of Minas Novas, among bushes called <i>carrascos</i>	Vulnerary (activation of peripheral circulation) and astringent	1	3	0	3	7
<i>Lantana pseudothea</i> A.St.-Hil. (= <i>Lippia pseudothea</i> (A.St.-Hil.) Schauer) / Verbenaceae / Capitão-do-mato, Chá-de-pedestre / Leaves	This species is common in the Serra de Candonga, near the village of Tapanhoacanga, in Minas Gerais Province, where it grows among quartzite rocks; it is also found in the district of diamonds	A much appreciated aromatic tea	3	3	1	0	7
<i>Croton antisiphiliticus</i> Mart. / Euphorbiaceae / Alcânfora (in the desert of São Francisco river)/ Barks	Also easily found in the fields near Tapeira, field house situated a few leagues of Paracatu, in the desert of São Francisco River	Leaves are used to treat wounds and snake bites; diuretic and antisiphilitic	1	1	2	3	7
<i>Croton campestris</i> A.St.-Hil. / Euphorbiaceae/ Velame-do-campo / Roots	Near Congonhas da Serra, a village situated in the mountains of Western Minas Province	Purgative; treatment of syphilitic diseases	1	1	2	3	7
<i>Croton perdicipes</i> A.St.-Hil. (= <i>C. antisiphiliticus</i> Mart.) / Euphorbiaceae / Pé-de-perdiz, Alcânfora / Roots and barks	Collected in March in the fields near Tanque, in the region of Minas Province called Comarca do Rio das Mortes. It was also easily found in the fields near Tapeira, field house situated a few leagues of Paracatu, in the desert of São Francisco River	Diuretic, treatment of syphilis	1	1	2	3	7
<i>Simarouba versicolor</i> A.St.-Hil. / Simaroubaceae / Paraiba / Leaves and barks	Meadows of Minas Gerais Province, near São Francisco River (Sertão)	The inhabitants of the Sertão consider the bark infused in <i>cachaça</i> a specific remedy for snake bites	1	3	2	1	7
<i>Cocculus platiphyllus</i> A.St.-Hil. (= <i>Chondrodendron platiphyllum</i> (A.St.-Hil.) Miers) / Menispermaceae / Butua/ Roots	This plant is found in the forests of Northern Minas Gerais Province, in the district of Minas Novas	Against intermittent fevers and liver diseases	1	1	2	2	6
<i>Gomphia hexasperma</i> A.St.-Hil. (= <i>Ouratea hexasperma</i> (A.St.-Hil.) Baill.) / Ochnaceae / Barks	This plant is common in the district of Minas Novas, and in the region of Minas Province called the desert of São Francisco. It grows among meadows sprinkled with tortuous and stunted trees (<i>tabuleiros cobertos</i>)	Veterinary use (to treat animal wounds due to astringent properties)	2	1	2	1	6

Table 1. Continuation

Scientific name ¹ / Family / Vernacular name / Used parts	Collecting sites registered by Saint-Hilaire	Traditional uses by Saint-Hilaire	I	II	III	IV	total
<i>Helicteres sacarolha</i> A.St.-Hil. / Malvaceae / Sacarrolha / Roots	Fields near the town of Paracatu, in the fields of Taracambi, near Nossa Senhora da Penha de Minas Novas, near the villages of Contendas and Olho d'Água, in its western and desert part called Sertão, near Formiga	Treatment of venereal infections	1	1	2	2	6
<i>Gomphrena officinalis</i> Mart. (= <i>Gomphrena arborescens</i> L.f.) / Amaranthaceae / Paratudo, Perpétua, Raiz-do-Padre-Salermã / Roots	Province of Minas Gerais, and Northern São Paulo Province	Against intermittent fevers, cramps and diarrhea, antiscorbutic	1	1	3	0	5
<i>Hortia brasiliana</i> Vand. ex DC. / Rutaceae / Quina / Barks	This plant is very common in native meadows of the Western and in most part of Minas Province, and Southern Goiás Province	Febrifuge	1	1	3	0	5
<i>Richardsonia rosea</i> A.St.-Hil. (= <i>Richardia brasiliensis</i> Gomes) / Rubiaceae / Poaia-do-campo / Roots	São João del Rei and Vila Rica counties	This plant is used with great success by farmers in the vicinity of S. João del Rei to replace <i>Cephaelis ipecacuanha</i> , which does not grow in this region	1	1	3	0	5
<i>Hybanthus poaya</i> (A.St.-Hil.) Baill., <i>Ionidium poaya</i> A.St.-Hil. (= <i>Pombalia poaya</i> (A.St.-Hil.) Paula-Souza) / Violaceae / Poaia-do-campo / Roots	Common in the West part of São Francisco River, in native meadows (<i>campos</i>) of Minas Gerais Province, and Southern Goiás Province, especially near Paracatu, Santa Luzia de Goiás, Meia Ponte, etc	Roots purgative, emetic and evacuant	1	1	2	0	4

¹Names listed as they were cited by Saint-Hilaire. Currently accepted names for the species are written in bold (nomenclatura listada como citada por Saint-Hilaire. A nomenclatura aceita atualmente aparece em negrito). ²This is a misapplied name. Despite being accepted, this species does not occur in Brazil. The correct binomial for this plant is *Drimys brasiliensis* Miers (este é um nome utilizado de forma incorreta. Apesar de aceito, esta espécie não ocorre no Brasil. O nome correto para esta espécie é *Drimys brasiliensis* Miers).

Categories used for the ranking (categorias usadas para classificação): I. **Type of use (tipo de uso):** Technological uses: grade 4; Food: 3; Cosmetics: 2; Remedies: 1. II. **Used part (causing less impact on the development/survival of the plant) (parte empregada que causa menor impacto no desenvolvimento/sobrevivência da planta):** Fruit: grade 4; Leaves: 3; Exudate or other substances: 2; Bark or roots: 1. III. **Distribution along Saint-Hilaire's path (distribuição ao longo das rotas de Saint-Hilaire):** Found everywhere: grade 4; Found in three regions: 3; Found in two regions: 2; Found in only one region: 1; Not found anymore: 0. IV. **Current available studies:** Performed with the same part of the plant and traditional use, as described by Saint-Hilaire: grade 4; Testing the same traditional use described by Saint-Hilaire but performed with other parts of the plant: 3; Performed with the same part of the plant but testing activities other than those described by Saint-Hilaire: 2; Other studies in general: 1; No study available: 0.

registered by the naturalists, especially by Saint-Hilaire, who named them as “wild fruits”. Studies have shown that these fruits have different bioactive substances that can act alone or together on various pathophysiological targets of chronic diseases, and can have many pharmacological properties such as anti-diabetic, anti-obese, anti-cancer, anti-oxidant and anti-inflammatory (Table 1) (Bicas *et al.*, 2011; Clerici & Carvalho-Silva, 2011; Souza *et al.*, 2011). The possibility of introducing such products in the form of nutraceuticals and food supplements could promote their use

and introduce them in international markets (Saklani & Kutty, 2008; Desmarchelier, 2010). However, one factor that holds back the use of these species is the lack of detailed agronomic studies, which could increase productivity and contribute to its market availability.

Among the medicinal species *Davilla rugosa* Poir. (“sambaibinha”) and *Stachytarpheta jamaicensis* (L.) Vahl (“gervão”) achieved the highest grades (12) in our evaluation. Leaves of *D. rugosa* have antibacterial properties, antioxidant activity and

a moderate antiulcerogenic effect (Mendes *et al.*, 2007; Roumy *et al.*, 2015). They are already used in a medicine named Hemovirtus®, indicated to treat hemorrhoids. Studies performed with *S. jamaicensis* confirm its antinociceptive activity, being useful as analgesic and febrifuge, as described by Saint-Hilaire (Sulaiman *et al.*, 2009). Both plants are widespread in all paths travelled in Minas Gerais and Goiás, making their exploitation through extraction or cultivation perfectly possible. Specifically concerning medicinal aspects, other species cited

by Saint-Hilaire are only nowadays being submitted to chemical and pharmacological studies to define their potential as remedies. Some examples are the anti-inflammatory effects of *Cochlospermum regium* (Mart. ex Schrank) Pilger (“butua-do-curvo”) (Inácio *et al.*, 2014), the antimicrobial activity of *Curatella americana* L. (“sambaíba”) (Toledo *et al.*, 2011) and *Luehea paniculata* Mart. & Zucc. (“açoita-cavalo”) (Calixto-Junior *et al.*, 2015), antinociceptive of *Davilla elliptica* A.St.-Hil. (“sambaibinha”) (Campos *et al.*, 2013; Oliveira-Azevedo *et al.*, 2015), anti-inflammatory and cytotoxic of *Croton antisiphiliticus* Mart. (“alcânfora”) (Fernandes *et al.*, 2013; Reis *et al.*, 2014), antiparasitic and bitterness of *Strychnos pseudoquina* (“quina-do-campo”) (Cosenza *et al.*, 2013), acaricide and antimicrobial of *Simarouba versicolor* A.St.-Hil. (“paraíba”) (Violante *et al.*, 2012; Valente *et al.*, 2014) and gastroprotective of *Helicteres sacarolha* A.St.-Hil. (“sacarrolha”) (Balogun *et al.*, 2015).

Two other plants described by Saint-Hilaire also have good potential in the market and must be better known and used: *Kielmeyera speciosa* A. St.-Hil. (“malva-do-campo”) (grade 9), employed in the past as emollient, and *Lippia pseudothea* (A.St.-Hil.) Schauer (“chá-de-pedestre”) (7), used as aromatic tea. Both species are not well distributed in the paths but similar species (*Kielmeyera rosea* Mart. & Zucc. and *Lippia lacunosa* Mart. & Schauer) occur in several cities in Northern Minas. We propose that, if better known, these plants could also be successfully commercialized as cosmetics and functional tea.

It is interesting to emphasize the potential of such species in all their aspects, since most of them can be easily found in the Cerrado. This could be very advantageous for the inhabitants around this area, particularly in the region around Jequitinhonha and Pandeiros Rivers in Northern Minas Gerais, firstly called “Sertão” by A. de Saint-Hilaire. The populations dwelling in these areas figure among the most impoverished in the state, and their natural environments have

been under rapid degradation since the introduction of a new economic activity in the 1970's: charcoal production out of Cerrado trees to meet the demand of the steel industry, which caused deep cultural and environmental changes in the area (Bethonico, 2009). However, this activity was not successful in improving the quality of life of local inhabitants. Thus, profitable and, most important, sustainable alternatives to give the population environmental awareness and involve them in the potential use of their natural resources, such as the local flora and products derived thereof, very often with high aggregated-value, are very welcome.

Final remarks

Historical research represents a rich source of information about the use of Brazilian biodiversity. The data recovered by the French naturalist Auguste de Saint-Hilaire in the 19th century are very rich in such information, and should be better known and used. We propose that *Xylopia aromatica* fruits (“pimenta-de-macaco”) and leaves of *Davilla rugosa* (“sambaibinha”) and *Stachytarpheta jamaicensis* (“gervão”) registered by him have nowadays high economic value and could be promptly used to produce income to the populations of inner of Minas Gerais and Goiás. Additionally, we consider that leaves of *Kielmeyera speciosa* (“malva-do-campo”) and *Lippia pseudothea* (“chá-de-pedestre”) are potentially attractive for market use. Efforts are necessary to study the management, cultivation and uses of these species.

ACKNOWLEDGEMENTS

The authors are grateful to FAPEMIG and CNPq (REFLORA) for grants and fellowships.

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