



## Original Article

## Useful Brazilian plants under the view of the writer-naturalist João Guimarães Rosa



Teresinha Lins Chaves<sup>a</sup>, Letícia Ricardo<sup>a,b,c</sup>, Juliana de Paula-Souza<sup>d</sup>, Maria das Graças Lins Brandão<sup>a,b,\*</sup>

<sup>a</sup> Centro Especializado em Plantas Aromáticas, Medicinais e Tóxicas, Museu de História Natural e Jardim Botânico, Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil

<sup>b</sup> Laboratório de Farmacognosia, Faculdade de Farmácia, Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil

<sup>c</sup> Departamento de Assistência Farmacêutica e Insumos Estratégicos, Secretaria de Ciência, Tecnologia e Insumos Estratégicos, Ministério da Saúde, Brasília, DF, Brazil

<sup>d</sup> DECEB, Universidade Federal de São João del Rei, Sete Lagoas, MG, Brazil

## ARTICLE INFO

## Article history:

Received 15 March 2015

Accepted 15 June 2015

Available online 10 July 2015

## Keywords:

João Guimarães Rosa

Writer

Cerrado

Savannah

Useful plants

## ABSTRACT

This study shows the results of a wide but non-exhaustive review on plants cited in the literacy work of the writer-naturalist João Guimarães Rosa (J.G. Rosa). Information about popular names and use of plants were recovered through a review in seven works of the author. The assignment of the scientific names was based in other previous ethnobotanical studies performed in similar areas of Cerrado in Minas Gerais state. For each species, data about their presence in the Brazilian Official Pharmacopoeia, or use for preparing commercial products were checked. A total of 964 popular names for plants were recovered, 59 of them being more frequently cited. From the total citations, 57 native species have their use described by the author but curiously, only thirteen are referred to as medicinal. It is assumed that the literature from J.G. Rosa is very rich in data about the utility of the plants from the Cerrado; however, the present work shows that his interest was rather the literary (poetic) creation, and we demystify that supposition.

© 2015 Sociedade Brasileira de Farmacognosia. Published by Elsevier Editora Ltda. All rights reserved.

## Introduction

Despite this richness and relevance, Brazil's native vegetation is continuously suffering destruction in consequence of different economic cycles, which started with the exploration of Brazil wood in early 1500s (Mittermeier et al., 2005). As a consequence, the knowledge about the useful native plants, mainly that from Amerindian origin, is currently threatened. Medicinal plants are widely used in both rural and urban areas of Brazil but the intense miscegenation of cultures over the last centuries has popularized the use of exotic and imported plants in medicine (Medeiros et al., 2013). Most plants are used according to folk tradition, mostly brought to the country by Europeans and Africans, this therefore privileging foreign over indigenous medicine. Information about the use of plants can be found in classic literature, such as Cervantes (López-Muñoz et al., 2006) or the Bible (Rennó, 1970), and such historical reviews represent an important instrument for recovering data about traditional, ancient knowledge (Brandão et al., 2011; Medeiros, 2008; Heinrich et al., 2006). Over the last years, our research group has been focusing on the study of materials from European naturalists that traveled throughout Brazil in the 19th century. A massive

amount of data about Brazilian native species have been collected and put available in a databank (dataplant.org.br). This type of work is important because this information is primary, that is, they were taken at a time when the native vegetation was still preserved and the use of plants was made almost exclusively from species of the Brazilian biodiversity. In this study, we show the results of a non-exhaustive review on the plants described in the books of the Brazilian writer-naturalist João Guimarães Rosa (J.G. Rosa).

J.G. Rosa was a novelist and short story writer. He was born in June 27, 1908 in Cordisburgo, a very small town in the north-central part of Minas Gerais state, Brazil, a place that inspired much of his literary work. He belonged to a traditional farming family of cattle ranchers. Since his childhood, J.G. Rosa had preferred to play with natural toys, and enjoyed organizing museums of insects and leaves, this habit originally being stimulated by readings about the topic. He was interested in studying plants and constructed maps and schemes for classifying them. He attended high school in Belo Horizonte, the state's capital city, where he also studied medicine. After receiving his degree in 1930, he worked as a physician in rural areas of Minas Gerais. At this time, he had already begun to write and publish short stories. In 1934, he applied for the Brazilian Foreign Service and became a career diplomat, and served in Germany, France and Colombia, Rosa is one of the most important Brazilian authors, and can be considered a writer-naturalist, since his work is based on a very accurate observation of the wild life. J.G. Rosa

\* Corresponding author.

E-mail: [mbrandao@farmacia.ufmg.br](mailto:mbrandao@farmacia.ufmg.br) (M.d.G.L. Brandão).

knew how to combine his medical knowledge with his role as a poet-naturalist. He discoursed about many aspects of the Cerrado in his books and was concerned with the predatory exploitation that was already occurring in the decade of 1950 (Chaves, 2013).

## Materials and methods

Data about plants cited in the work of J.G. Rosa were obtained from an extensive, but no-exhaustive review, of the following publications: Sagarana (31st ed., 1984, hereafter cited as SAG); *Manuelzão and Miguilim* (*Big Manuel and Little Manuel*, 9th ed., 1984, MAMI); *Noites no Sertão* (*Nights in the Backlands*, 9th ed., 2001, NS); *No Urubuquaquá no Pinhém* (*In Urubuquaquá, in Pinhém*, 9th ed., 2001, UP); *Grande Sertão: Veredas* (*The Devil to Pay in the Backlands*, 36th ed., 1986, GSV); *Primeiras Estórias* (*First stories*, 47th ed., 1988, PE) and *Tutaméia* (6th ed., 1985, TUT). These books were first published in 1946 (SAG), 1956 (MAMI, NS, UP and GSV), 1962 (PE) and 1967 (TUT).

Each book was carefully studied and informations on popular names and uses of plants were recovered. All the names assigned for plants were collected and organized in a list, presented as supplementary material. It is important to note that many names of plants were also written with variations. For example: we can find in the books the name “abóbora” and other derivatives like “abóbora-d’água” and “abóbora-moranga”. Another example is the “angelim”, “angelim-amargo”, “angelim-macho” or “angelim-umburana”. It is impossible to determine whether these variations of names were assigned for the same “abóbora” or “angelim”, respectively, or represent different species of plants. The verification of which name was assigned for a plant was difficult, because the author gave different names for animals, insects and landscape too.

From the global list of popular names, Table 1 was constructed with the more frequently cited names (five times or more in the whole work). The native plants that had some kind of use described by the author, were marked with (\*) and included in Table 2. This table also contains the other native species less frequently cited, but with some kind of use described. For plants in Table 2, scientific names were assigned by crossing the popular names with data from ethnobotanical studies conducted in areas of Cerrado from Minas Gerais and Goiás states (Lima et al., 2012; Silva-Júnior, 2005; Rodrigues and Carvalho, 2007; Silva-Júnior and Pereira, 2009; Vila-Verde et al., 2003; Rizzo et al., 1999). The names were also compared with data from field books of two European naturalists that traveled in areas of Cerrado in 19th century (Fagg et al., 2014; Brandão et al., 2012). For many plants, assigning scientific names was not difficult because they are well known and have current popular use. Examples of these plants include carqueja, easily assigned as *Baccharis crispa* and pequi, as *Caryocar brasiliense*. Other scientific names were assigned based on the comments made by the author, for example the arnica. His description included that this plant had the form of a chandelier, a typical characteristic of *Lychnophora* species, Asteraceae. According to a study performed by Meyer (2008), the author used in his field notes several plant characteristics (overall aspect, colors and odor) to record their popular names. For other plants, it was more difficult to assign scientific names, especially when the same popular name refers to two or more species. This is the case of laranjeira-do-campo, which can refer to both *Styrax camporum*, Styracaceae, and *Esenbeckia febrifuga*, Rutaceae. There is no doubt that studying the vegetation and performing field surveys with local inhabitants for analyzing living specimens in the areas visited by the author would be the most appropriate way to assign scientific names to the plants cited in this books, however, this task would represent an effort beyond the purposes of this work, and was not performed at this moment.

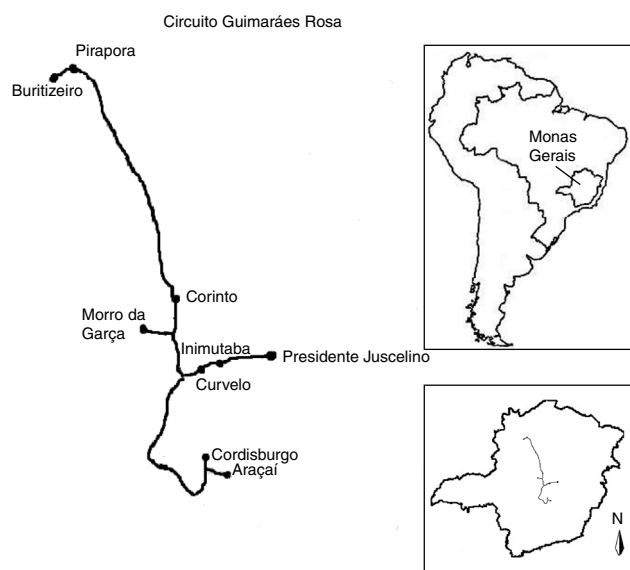


Fig. 1. Paths taken by Guimarães Rosa through the “sertão”.

Source: FONTE: [http://www.circuitoguimaraesrosa.com.br/novo/?page\\_id=260](http://www.circuitoguimaraesrosa.com.br/novo/?page_id=260)

Correct spelling, application and authorship of scientific names of native species were checked in the online database Lista de Espécies da Flora do Brasil (<http://floradobrasil.jbrj.gov.br>) and Tropicos (<http://www.tropicos.org/Home.aspx>) was consulted for the exotic species. Specialists were further consulted for the confirmation of doubtful names.

Table 2 also provides the reference for each book and page where the information was obtained. It also indicates the descriptions of the various categories of use (medicinal, food, construction, fuel, technology and ornamental), among other observations (Brito and Senna-Valle, 2012). We checked the relevance of each plant as medicinal by their citation in (1) monographs from the 1st edition of the Brazilian Pharmacopoeia (Brandão et al., 2009) and (2) information on the use of plants for the preparation of commercial products by Pharmaceutical Laboratories from Minas Gerais (Brandão et al., 2010).

## Results and discussion

The Cerrado offers a vast biological diversity and represents one of the most plentiful natural resources for potentially useful species, including medicinal plants. European naturalists who visited Brazil during the 19th century, such as Auguste de Saint-Hilaire and George Gardner, also recorded in their works the use of hundreds of useful species from the Cerrado, which they called, just like J.G. Rosa did, *sertão* (backlands) (Fagg et al., 2014; Brandão et al., 2012). J.G. Rosa traveled throughout many areas of the Cerrado in Minas Gerais, and his impressions are widely described in his work. Fig. 1 shows the areas he visited around the state, currently known as “J.G. Rosa circuit” (Bezerra and Heidemann, 2006). J.G. Rosa has observed the aspects of biodiversity and culture of these places with astonishing accuracy, and made poetry with several of them. The author created a unique, innovative language inspired in the folk speech of the Brazilian backlands, by using literacy resources such as rhymes, metaphors and magical events.

In this review, 964 popular names for plants were recovered from the seven studied books of J.G. Rosa, and this elevated number confirms his interest in such register. Several different names were assigned for “capim” (grasses, 86), “cipó” (vine, 17), “erva” (herbs, 15), “fava” (fave, 4) and “paus” (sticks, wood, 27). Fifty-nine names of plants, including their variations, were cited five times or more

**Table 1**

Popular names and their variations more frequently cited by J.G. Rosa, and respective pages: *Urubuquaquá no Pinhém* (UP), *Sagarana* (SAG), *Grande Sertão: Veredas* (GSV); *Noites no Sertão* (NS), *Manuelzão and Miguilim* (MAMI), *Primeiras Estórias* (PE) and *Tutaméia* (TUT).

Popular name	UP (1956)	SAG (1946)	GSV (1956)	NS (1956)	MAMI (1956)	PE (1962)	TUT (1967)	
Abóbora		104					123, 195	
Abóbora-d'água		280	145					
Abóbora-moranga			246					
Alecrim	38,44,50,132,133		120, 275	37,167			51,94	
Alecrim-tristão	152							
Algodão/algodoal		203, 304, 318	308	158, 218	69			
Algodão-bibol			537					
Algodão-mussulim			537					
Algodão-rasga-letras			537					
Angelim	158	185, 253, 268			237			
Angelim-amargo	149, 203							
Angelim-macho	149							
Angelim-rosa	254							
Angelim-umburana				36				
Angico*		42, 200, 266, 373	15, 281, 490		237		190	
Angico-surucucú	150							
Angico-verdadeiro		236, 321						
Angico-vero	154							
Araçá		32	35				181	
Araçá-branco			179					
Araçá-das-almas	150							
Araçá-de-pomba	150		181					
Araticum*	270	200, 322	97, 326, 412, 504				190	
Araticum-da-beira-do-rio	150							
Araticum-do-sertão	149							
Aroeira	27	21, 33, 153, 191, 244, 266, 277	24		151			
Aroeira-brava			151					
Aroeira-campestre			151					
Arrozal/arroz		133, 138, 142	86, 263, 295, 364		69, 123, 188		194	
Arroz-de-cutia	154							
Assa-peixe*	153, 230	134, 168, 252	163, 449	158	158			
Assa-peixe branco	153							
Bálsamo		243	281					
Bálsamo (da horta)					101			
Bálsamo-de-cheiro eterno	31, 149							
Bálsamo de unguento				34, 283				
Bambu		87, 119, 153, 167, 243, 252, 254, 263	35	186			123	
Banana			256		188		199	
Banana-brava							51	
Banana-ouro		278						
Bananeira	224	135, 185, 217, 317	130, 369		60			
Bananeira-do-campo		160						
Barbatimão*		200, 322, 376	15	149	126		181	
Buriti*	32, 36, 53, 70, 101, 108, 109, 111, 112, 115, 118, 119, 121, 128, 130, 139, 141, 145, 146, 147, 148, 150, 151, 159, 160, 161, 163, 165, 174, 182, 186, 187, 192, 206, 214, 218, 219, 220, 225, 226, 227, 236, 242, 260, 283, 296, 302, 311	43, 68, 256, 377	22, 35, 44, 57, 65, 66, 85, 97, 101, 135, 166, 253, 268, 269, 270, 271, 273, 274, 277, 279, 285, 310, 326, 331, 333, 335, 353, 372, 383, 445, 449, 457, 482, 483, 492, 504, 529,	73, 117, 125, 127, 134, 140, 146, 150, 151, 152, 153, 154, 157, 158, 166, 167, 168, 169, 171, 180, 181, 188, 189, 190, 208, 209, 222, 223, 226, 230, 236, 257, 265, 268, 285, 299, 302, 316		17, 19, 76, 89, 95, 111, 118, 126, 142, 147, 148, 201, 215, 238, 253, 255	9	72, 179, 180, 191
Buriti-bravo	165							
Buritizedal				70, 73				
Café/cafezal		19, 175, 317, 325	24, 33, 99, 263, 423, 434	36, 84, 310			82	
Caju			265					

Table 1 (Continued)

Popular name	UP (1956)	SAG (1946)	GSV (1956)	NS (1956)	MAMI (1956)	PE (1962)	TUT (1967)
Cajueiro	165		170, 406		130	104	
Cajueiro-anão			412				
Canela-de-ema*	151		23, 462			9	52
Caraíba	165, 154		330, 409		236		
Caraíba-de-flor-roxa			268				
Caraíba-urucuia			269				
Carnaúba	122, 150		65, 81, 101				
Carnaubais			271				
Cedro		135, 138, 143	89	36	130	18	
Cedro-fêmea	150						
Cedro-í	150						
Cedro-nã	150						
Congonha*	152, 187	379	190				
Congonha-de-goiás	152						
Coqueiro		140, 146, 152, 239, 245, 376		145, 151, 155	30		
Coqueiro catolé		169					
Embira (corda)		321	61	148			
Embira-barriguda-do-sertão	149						
Embira de bananeira				163			
Faveira*	65, 149, 150		89, 203, 406	160			190
Faveleira	151						
Feijão			263, 295, 465		69, 123, 188		
Feijão bravo			87, 436				
Feijão-da-seca			364				
Feijão mulatinho		174					
Feijão preto		174					
Feijoal		246					
Fumo*	273, 300	158, 159, 184, 211, 243, 260, 366	177, 256, 326, 412, 413	135, 222			
Gameleira	31	134, 209, 210	84, 265, 449, 450	51, 140	68, 152, 160		
Gameleira branca			449				
Goiaba/Goiabal		88, 140, 209	434		49		99, 181
Goiabeira	213, 232			310			
Gravatá*	31, 50, 154, 231	246, 253	208, 218, 265, 449	70, 236, 243			
Ingá		43		167		79	
Ingazeiro		210	251				
Ipê*	100, 111, 154, 165, 236					9, 62	190, 198
Jacarandá		130, 255					
Jacarandá anosos		373					
Jacarandá-cabiúna	65, 142						
Jacarandá-de-espinho							52
Jacarandá-mimosim	149						
Jacarandá-muxiba	149						
Jacarandá-tã					70		
Jacarandá-violeta					73		
Jatobá*	165, 208	177, 306	12, 199	36	46		
Jatobá-do-campo				159			
Jenipapeiro	64, 154	145	406	137	30, 114, 118		
Jequitibá*		185, 321		167	84		
Jequitibá-rosa		255					
Jequitibá-vermelho		257					
Laranja		60, 277		267	134, 135		
Laranja-da-china		247					
Laranja-da-terra		368			138		
Laranja		318	275	200, 212, 313			
Laranjeira			403		188		
Laranjeira-do-campo				47			
Limão		136, 158		36	135		
Limoeiro	249	356		224, 251		73	
Lírios	164, 271		147			324	
Lírios-do-brejo	271						
Lobeira*	492		108, 148, 150, 160	154			
Mamão		138			104, 105	356	
Mamão-macho				249			
Mamoeiro	517			249		359	
Mamoeiro-bravo				154			
Mandioca	4, 203, 283	123		224, 254			
Mandioca Brava	4						
Mandiocal	203					317	51

Table 1 (Continued)

Popular name	UP (1956)	SAG (1946)	GSV (1956)	NS (1956)	MAMI (1956)	PE (1962)	TUT (1967)
Manga	49					246, 266	
Mangueira	168		186	225, 230		153, 217	166
Mangaba	24, 37		259			211	51, 190
Mangabal	36						
Mangabeira*	25						
Mangabeiral	446						
Mangabeirinha	37						
Mangabeiro						377	
Mangabeira						322	
pedidora-de-esmola							
Milho	465	69, 214	28, 32, 172			135, 138, 161, 203, 220, 227, 228, 284, 295, 304, 323	51
Murici*	203			233		177, 196, 322	190
Oiricuri	127, 462	238		188		93	
Paineira*			39, 76, 243	31, 66, 143			
Palmeira	49, 413, 449	210	150, 168, 180, 316	32, 53, 101, 102, 192, 217	123, 124	169	190
Palmeira-leque						265	
Palmeira-pindoba	458						
Palmeiral	413						
Palmeirim				150			
Pau-bate-caixa*	424		29, 150	100, 101, 149		265	
Pau-d'arco				233, 271, 311		33, 376	
Pau-d'óleo*	84, 89			31, 65		68, 201, 376	
Pau-terra			159, 160, 161, 163			319	
Pequi*	158, 265, 256		29	270		277	127
Pequizeiro	199, 326		159				
Pimenta-de-macaco*	257		167	137, 142, 271			
Sassafrás	22, 504		32, 149, 266	108, 124, 161			51, 83
Sassafrás-da-serra				150			
Sassafrás-serrano							51
Sassafrázal	268						
Sucupira	61		38	108		183, 205	
Tingui†		93, 152		150, 233		44	57
Umburana	296, 496			146, 218, 235			
Umburana Branca	455						

\* Plants with use specified by the author.

and were included in Table 1. This table shows that the book with highest number of citations for plants is UP (158 citations), followed by GSV (153) and NS (123). SAG, MAMI, PE and TUT have 114, 55, 47 and 36 citations of plants, respectively. This large number of different popular names registered by the author within the short distances he covered in his travels reflects his interest in such information, and the strong bonds of the inhabitants with the Cerrado biodiversity.

Among these more frequently cited plants from Table 1, 22 (marked as\* in Table 1) have their uses detailed by the author. These and 35 other plants were included in Table 2. Twelve species are described as food or for beverage preparation (sweets, wines and liqueurs) among them araticum (*Annona* spp.), buriti (*Mauritia flexuosa*), cagaiteira (*Eugenia dysenterica*), faveira (*Dimorphandra mollis*), gabirola (*Campomanesia pubescens*), gravatá (*Aechmea bromeliifolia*), juá (*Ziziphus joazeiro*), lobeira (*Solanum lycocarpum*), mangabeira (*Hancornia speciosa*), pequi (*Caryocar brasiliense*), and pitanga (*Eugenia pitanga*) and tingui (*Magonia pubescens*). Many species from the Cerrado have recently gained acceptance and importance in industry, and some of them are marketed in Brazil in the form of juices, sweets, ice cream and candies. Tropical ecosystems are very rich in edible fruits and several of them were registered by the naturalists, especially Saint-Hilaire, who named them “wild fruits” (Brandão et al., 2012). Saint-Hilaire specified that the fruits from the Cerrado were certainly better than the European, but it was necessary to submit them to cultural tracts. In fact, the possibility of introducing such products in the form of nutraceuticals and food supplements could improve their use

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

Six other plants are described as useful in the manufacture of various products, such as macela-do-campo (*Achyrocline satureioides*) in pillows; macaúba *Acrocomia aculeata* and tingui (*Magonia pubescens*) for the preparation of soap, aroeira (*Schinus terebinthifolius*) and barbatimão (*Stryphnodendron* spp.) in the tannery. Five species were presented as fuel, five as ornamental and four as useful for construction. Seven species were cited in the text as trees that grow in river banks (“beira de rio”) and this information is highlighted by us because it might be useful to implement projects of gallery forest restoration. For buriti (*Mauritia flexuosa*), which was cited several times, the author provides information regarding its confirmed and potential uses. This plant also attracted the attention of Saint-Hilaire and Gardner who described the same possibilities for its use (Fagg et al., 2014; Brandão et al., 2012). The same uses for the species of Table 2 were also observed in more recent ethnobotanical studies (Silva-Júnior, 2005; Borba and Macedo, 2006; Rodrigues and Carvalho, 2007; Silva-Júnior and Pereira, 2009).

Thirteen species were cited as remedies but only four has specific therapeutic indications. For all of them, the properties could be explained by the phytochemical content. Barks of angico (*Anadenanthera* spp.), for example, were described as useful in bath to heal wounds and were also cited by the author as useful in

**Table 2**  
Useful plants from the Cerrado cited by J.G. Rosa in 7 of his books.

Popular names/possible scientific names and families	Book*: page	Uses
Alcanfor, pé-de-perdiz/ <i>Croton antisiphiliticus</i> Mart. (Euphorbiaceae)	UP: 31,153; SAG: 243	Remedy
Almecega, almesca/ <i>Protium heptaphyllum</i> (Aubl.) Marchand (Burseraceae) <sup>1</sup>	GSV: 177; NS: 167	Resin
Angelim-umburana/ <i>Andira</i> spp. (Fabaceae)	NS: 36	Aromatic oil for women's hair
Angico/ <i>Anadenanthera</i> spp. (Fabaceae) <sup>1,2</sup>	See table 1	Remedy to heal wounds (bath with the bark)/tannery fruit/candies
Araticu, araticum/ <i>Annona</i> spp. (Annonaceae)	See table 1	
Arnica/ <i>Lychnophora</i> spp. (Asteraceae) <sup>2</sup>	GSV: 281; PE: 9; SAG: 243; TUT:50	Remedy for pain and edema
Aroeira/ <i>Schinus terebinthifolius</i> Raddi (Anacardiaceae) <sup>1</sup>	GSV: 151	Tannery
Assa-peixe/ <i>Vernonanthura polyanthes</i> (Spreng.) Vega & Dematt. (Asteraceae) <sup>2</sup>	See table 1	Remedy for ocular inflammation
Barbatimão/ <i>Stryphnodendron</i> spp. (Fabaceae) <sup>1,2</sup>	See table 1	Tannery/coal/wood/cork
Buriti/ <i>Mauritia flexuosa</i> L.f. (Arecaceae)	See table 1	Liqueur/wine/candies/food/construction/handcrafts (networks, mat, ropes, baskets, bags, boxes).
Cabriúva/ <i>Myroxylon peruiferum</i> L.f. (Fabaceae)	NS 32	Balsamic, odoriferous
Cagaiteira/ <i>Eugenia dysenterica</i> (Mart.) DC. (Myrtaceae)	MAMI: 152,177; UP: 187; NS: 47, 158; SAG: 191	Tea/fruit
Cambará/ <i>Lantana camara</i> L. (Verbenaceae)	SAG: 56, 257–258	Witchcraft
Candeia, guia-torto/ <i>Eremanthus</i> spp. (Asteraceae) <sup>1</sup>	GSV: 469; UP: 160; TUT: 51, 52	Fuel
Canela-de-ema/ <i>Vellozia</i> spp. (Velloziaceae)	See table 1	Fuel
Carne de vaca/ <i>Roupala montana</i> Aubl. (Proteaceae)	NS: 166–167	Observed in river banks (potentially useful in the restoration of gallery forests)
Caroba-do-campo/ <i>Jacaranda caroba</i> (Vell.) DC. (Bignoniaceae) <sup>1,2</sup>	NS: 34; PE: 62	Remedy
Carqueja/ <i>Baccharis crispa</i> Spreng. (Asteraceae) <sup>1,2</sup>	UP: 31	Remedy
Congonha/ <i>Rudgea viburnoides</i> (Cham.) Benth. (Rubiaceae) <sup>2</sup>	See table 1	Tea
Faveira/ <i>Dimorphandra mollis</i> Benth. (Fabaceae)	See table 1	Liqueur/wood for construction
Fumo/ <i>Nicotiana tabacum</i> L. (Solanaceae)	See table 1	Remedy
Gabiroba/ <i>Campomanesia pubescens</i> (Mart. ex DC.) O.Berg (Myrtaceae)	SAG: 177, 196	Fruit/perfum
<b>Gameleira/FicusgomelleiraKunth(Moraceae)</b>	UP: 208	Remedy (milk)
Goiabeira/ <i>Psidium guajava</i> L. (Myrtaceae)	UP: 213, 232 NS: 310	Tea
Gonçalo Alves/ <i>Astronium fraxinifolium</i> Schott (Anacardiaceae)	NS: 32,167; UP: 149,	Observed in river banks (potentially useful in the restoration of gallery forests)
Gravatá/ <i>Aechmea bromeliifolia</i> (Rudge) Baker (Bromeliaceae)	See table 1	Perfum/fruits
Ingá/ <i>Inga vera</i> Willd. (Fabaceae)	GSV: 251; NS: 167; PE: 79; SAG: 43	Observed in river banks (potentially useful in the restoration of gallery forests)
Ipê, caraíba/ <i>Handroanthus</i> spp., <i>Tabebuia</i> spp. (Bignoniaceae) <sup>2</sup>	See table 1	Wood for construction
Jatobá/ <i>Hymenaea courbaril</i> L., <i>H. stigonocarpa</i> Mart. ex Hayne (Fabaceae) <sup>2</sup>	See table 1	Remedy, resin
Jequitibá/ <i>Cariniana</i> spp. (Lecythidaceae) <sup>1,2</sup>	See table 1	Observed in river banks (potentially useful in the restoration of gallery forests)
Joá/ <i>Ziziphus joazeiro</i> Mart. (Rhamnaceae)	MAMI: 68; SAG: 27,13, 252	Fruits
João-da-costa/ <i>Peltastes peltatus</i> (Vell.) Woodson (Apocynaceae)	UP: 31	Remedy
Jurema/ <i>Mimosa</i> spp. (Fabaceae)	GSV: 462	Tea
Landim, olandim/ <i>Calophyllum brasiliense</i> Cambess. (Calophyllaceae)	NS: 166–167	Observed in river banks (potentially useful in the restoration of gallery forests)
Língua-de-teiú/ <i>Casearia sylvestris</i> Sw. (Salicaceae) <sup>1</sup>	UP: 31	Remedy
Lobeira/ <i>Solanum lycocarpum</i> A.St.-Hil. (Solanaceae)	See table 1	Fruits/ornamental
Macaúba/ <i>Acrocomia aculeata</i> (Jacq.) Lodd. ex Mart. (Arecaceae)	GSV: 126, 256, 411	Soap
Malva-do-campo/ <i>Kielmeyera rosea</i> Mart. & Zucc. (Calophyllaceae)	UP: 235; PE: 9; SAG: 175	Ornamental
Mamão/ <i>Carica papaya</i> L. (Caricaceae)	UP 259	Leaves clean/clear clothes
Mangabeira, mangabas/ <i>Hancornia speciosa</i> Gomes (Apocynaceae)	See table 1	Fruits/candies
Marcela-do-campo/ <i>Achyrocline satureioides</i> (Lam.) DC. (Asteraceae)	GSV: 205; MAMI: 37	Pillow/tea
Marmelada-de-cachorro/ <i>Cordia sessilis</i> (Vell.) Kuntze (Rubiaceae)	NS: 167; UP: 151	Observed in river banks (potentially useful in the restoration of gallery forests)
Murici/ <i>Byrsonima verbascifolia</i> (L.) DC. (Malpighiaceae)	See table 1	Fruit/fuel
Paineira/ <i>Ceiba speciosa</i> (A.St.-Hil.) Ravenna (Malvaceae)	See table 1	Ornamental
Pau bate-caixa, bate-caixa/ <i>Palicourea rigida</i> Kunth (Rubiaceae) <sup>1,2</sup>	See table 1	Perfum
Pau-d'óleo/ <i>Copaifera langsdorffii</i> Desf. (Fabaceae) <sup>1,2</sup>	See table 1	Wood for construction
Pau-pombo/ <i>Tapirira guianensis</i> Aubl. (Anacardiaceae)	GSV: 90, 449; NS: 167	Observed in river banks (potentially useful in the restoration of gallery forests)
Pau-doce/ <i>Vochysia tucanorum</i> Mart. (Vochysiaceae)	GSV: 423; MAMI: 157; NS: 160; SAG: 319	Ornamental
Pau-ferro/ <i>Libidibia ferrea</i> (Mart. ex Tul.) L.P. Queiroz (Fabaceae)	NS: 40	Construction

Table 2 (Continued)

Popular names/possible scientific names and families	Book <sup>a</sup> : page	Uses
Pau-santo/ <i>Kielmeyera speciosa</i> A.St.-Hil. (Calophyllaceae)	NS: 160; UP: 101; SAG: 196, 319	Ornamental
Pequizeiro, pequi/ <i>Caryocar brasiliense</i> Cambess. (Caryocaraceae)	See table 1	Liqueur/fruit
Peroba/ <i>Aspidosperma tomentosum</i> Mart. (Apocynaceae)	GSV: 89; UP: 214; SAG: 37; TUT: 190	Wood for construction
Pimenta-de-macaco, pindaíba/ <i>Xylopi aromaticum</i> (Lam.) Mart. or <i>Xylopi sericea</i> A.St.-Hil. (Annonaceae)	See table 1	Remedy for chest pain/tea
Pitanga/ <i>Eugenia pitanga</i> (O. Berg) Kiaersk. (Myrtaceae) <sup>2</sup>	GSV: 265; PE: 9; SAG: 154, 370	Fruit
Tingui/ <i>Magonia pubescens</i> A.St.-Hil. (Sapindaceae)	See table 1	Soap/fruit/fuel
Unha-de-vaca-roxa/ <i>Bauhinia</i> spp. (Fabaceae) <sup>2</sup>	UP: 31	Remedy
Velame-branco/ <i>Mandevilla velame</i> (A.St.-Hil.) Pichon (Apocynaceae) <sup>2</sup>	PE: 9	Ornamental

See other popular names in the list (Supplementary material).

<sup>a</sup> GSV, Grande Sertão: Veredas, MAMI, Manuelzão e Miguilim, NS, Noites do Sertão, UP, No Urubuquaquá, no Pinhém, PE, Primeiras Estórias, SAG, Sagarana, TUT, Tutaméia.

<sup>1</sup> Species included in the Brazilian Official Pharmacopoeia 1st Edition (1926) (Brandão et al., 2009).

<sup>2</sup> Species used for medicine preparation by Pharmaceutical Laboratories of Minas Gerais (Brandão et al., 2010).

tannery, besides barbatimão and arceuthobium – this plant is largely known as rich in tannins, astringent substances that promote cicatrization (Oliveira et al., 2011; Feuerstein et al., 2014). The author also mentions that arnica was used to treat pain and edema. Although arnica is the official name of an European plant that does not naturally occur in Brazil (*Arnica montana*), other native species are known as arnica in this country, and based on the description of J.G. Rosa, this name can be assigned to a species of *Lychnophora* (Asteraceae). Similarly to *A. montana*, recent studies have shown that species in this genus are also rich in volatile sesquiterpene lactones, a compound with topical anti-inflammatory activity (Abreu et al., 2013). *Vernonanthura polyanthes* is popularly known by the vernacular name “assa-peixe”, and this species is very rich in resins and volatile oils with antimicrobial and anti-inflammatory properties (Silva et al., 2012; Temponi et al., 2012), which can explain its use to treat eye inflammations. Pimenta-de-macaco is the popular name given for two different species of *Xylopi* (*X. aromaticum* and *X. sericeum*) and the author described its use to treat chest pains. Recent research has indicated that *Xylopi* species are rich in volatile substances that cause hyperemia, and can alleviate such pain (Oliveira et al., 2014).

It is generally assumed that the literature from J.G. Rosa is very rich in data about the medical utility of the plants from the Cerrado, but we provide consistent evidence that this assumption is equivocal. J.G. Rosa grew in a small town in the very countryside of Brazil, and had since his childhood strong interest in natural sciences (Chaves, 2013). From 1931 to 1933, he was a “hinterland medical doctor” in small towns in Minas Gerais, and he certainly had contact with the medicinal plants used by the population. It is possible that these experiences have influenced him to do such an extensive inventory about the plants (Table 1). However, one point needs clarification and must be discussed: why J.G. Rosa did mention so few observations about the therapeutic properties of the plants in his works (only four plants)? Some hypotheses can be formulated about this matter: (i) contrary to what is generally assumed, J.G. Rosa did not have enough knowledge about the medical utilities of the plants, and this kind of information was not relevant for his artistic purposes. His interest was to know the names of the plants, regardless of their use, only for the purposes of a poetic creation. He wrote many interesting observations for some useful plants, like mangabeira that “asks for alms” (SAG 322), arnica “in pale chandeliers” (PE 9), barbatimão with “round little leaves just like coins” (NS 150); (ii) he had knowledge about the utility of the plants but still, their medicinal aspect was not relevant for his creative purposes. It is important to note that

the literacy output of J.G. Rosa spanned the decade of 1950–1960 (except Sagarana, which was published in 1946). At this time, there was a growing establishment of large foreign pharmaceutical companies in Brazil, and the massive introduction of synthetic and industrialized products. This fact promoted strong changes on the methods applied in conventional medicine, the medicinal plants being considered as ineffective and a marginal method of treatment (Carvalho, 2003; Telles, 2007). During the previous period, most medicines were prepared out of native species, and in many cases, their use had been formalized by the inclusion in the Brazilian Pharmacopoeia (Brandão et al., 2009). Nine plants from Table 2 figure in the Pharmacopoeia: almecega (*Protium heptaphyllum*), angico (*Anadenanthera* spp.), barbatimão (*Stryphnodendron* spp.), camarã (*Lantana camara*), caroba-do-campo (*Jacaranda caroba*), carqueja (*Baccharis crispa*), jequitibá (*Cariniana* spp.), lingua-de-teiú (*Casearia sylvestris*) and pau-d’óleo (*Copaifera langsdorffii*). At that time, Brazilian pharmaceutical companies also produced remedies using native medicinal plants, based on traditional formulas. Among them, angico (*Anadenanthera* spp.) and assa-peixe (*Vernonanthura polyanthes*) have their medical use described by the author (Table 2). (iii) He had vast knowledge about the potential of the plants, and avoided to spread it, for the sake of their conservation. He was a writer-naturalist, but with a very different perception of nature compared to the European naturalists, who had a rather utilitarian vision of the Brazilian richness (Brandão et al., 2011). It is also interesting to point out that J.G. Rosa was a diplomat and lived for many years in Europe, and he was probably aware of the international economic interest on Brazilian plants. At the time of J.G. Rosa the legislation regulating the access and use of our biodiversity and traditional knowledge was inexistent, and our hypothesis is that the author deliberately omitted this valuable information, in order to preserve our natural and immaterial heritage from the interests of foreign and aggressive pharmaceutical companies.

References for uses of exotic or other native unidentified plants were also found in the works of J.G. Rosa: basil for aromatization of clean clothes (NS 32), lettuce roots for sleeping (SAG 219, NS 310), balsam plaster (MAMI 101), poison milk of milkweed (GSV 44) and folha-miuda (GSV 412, NS 167), erva-café (UP 216) and erva-de-folha-miúda is poisonous for cattle (UP199), fennel (GSV 205) and urumbaba (GSV 357) to treat liver disorders; orange flower tea as soothing (MAMI 188), folha-santa (MAMI 102), frei-jorge (GSV 357, UP 149) and losna (NS 101) as remedy, erva-do-diabo tea (VS 267, UP 153). The scarce number of exotic species cited in his works might be an evidence that the areas of Cerrado where he traveled through were still preserved. Many studies have shown

that in areas of Atlantic Forest and Pampas, for example, there is a predominance of the use of exotic plants (Medeiros et al., 2013). Unfortunately, currently the areas described by J.G. Rosa are suffering an aggressive replacement of their native vegetation by monoculture of *Eucalyptus*. In other Cerrado areas, grain production and cattle have gradually occupied the land that was previously covered by native vegetation (Bertran, 2011; Martinelli et al., 2010). Efforts are urgently needed to preserve the biodiversity of this Biome, including the ones directed to literature and poetry, as J.G. Rosa did.

## Conclusion

This work confirms the broad description of Cerrado plants in the literary work of the writer-naturalist and shows, contrary to common sense, the absence of a utilitarian view of the plants.

## Authors' contributions

TGLBC has done the review in the books; LMR and MGLB have organized the plants and the manuscript; JP-S has revised the botanic names and the occurrence of the plants.

## Conflicts of interest

The authors declare no conflicts of interest.

## Acknowledgements

This review contains the results of T.G.L.B. Chaves' Ph.D. Thesis funded by CAPES/ Brazil (FFLCH-USP). The authors also thank FAPEMIG and CNPq for fellowships and financial support, Dr. Juliana Rando (Universidade Federal do Oeste da Bahia) and Dr. Michel Barros for their expertise in Legume names, and Dr. Benoit Loeuille (Universidade de São Paulo) for his advise in Asteraceae.

## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.bj.2015.06.003](https://doi.org/10.1016/j.bj.2015.06.003).

## References

- Abreu, V.G., Correa, G.M., Silva, T.M., Fontoura, H.S., Cara, D.C., Piló-Veloso, D., Alcântara, A.F., 2013. Anti-inflammatory effects in muscle injury by transdermal application of gel with *Lychnophora pinaster* aerial parts using phonophoresis in rats. *BMC Complem. Altern. Med.* 20, <http://dx.doi.org/10.1186/1472-6882-13-270>.
- Bertran, P., 2011. *História da Terra e do Homem do Planalto Central*, 2nd ed. Editora da UNB, Brasília, pp. 615.
- Bezerra, M.C., Heidemann, D., 2006. Viajar pelo sertão Roseano é antes de tudo uma descoberta. *Estudos Avançados* 20, 7–17.
- Borba, A.M., Macedo, M., 2006. Plantas medicinais usadas para a saúde bucal pela comunidade do bairro Santa Cruz, Chapada dos Guimarães, MT, Brasil. *Acta Bot. Bras.* 20, 771–782.
- Brandão, M.G.L., Cosenza, G.P., Grael, C.F.F., Netto, N.L., Monte-Mór, R.L.M., 2009. Traditional uses of American plant species from the 1st edition of Brazilian Official Pharmacopoeia. *Rev. Bras. Farmacogn.* 19, 478–487.
- Brandão, M.G.L., Cosenza, G.P., Stanislaw, A.M., Fernandes, G.W., 2010. Influence of Brazilian herbal regulations on the use and conservation of native medicinal plants. *Environ. Monit. Assess.* 164, 369–377.
- Brandão, M.G.L., Pignal, M., Romaniuc, S., Grael, C.F.F., Fagg, C.W., 2012. Useful Brazilian plants listed in the field books of the French naturalist Auguste de Saint-Hilaire (1779–1853). *J. Ethnopharmacol.* 143, 488–500.
- Brandão, M.G.L., Grael, C.F.F., Fagg, C.W., 2011. European naturalists and medicinal plants of Brazil. In: Grillo, O., Venora, G. (Eds.), *Biological Diversity and Sustainable Resources Use*, vol. 101–120. Intech, Croatia, 158pp.
- Brito, M.R., Senna-Valle, L., 2012. Diversity of plant knowledge in a “Caicara” community from the Brazilian Atlantic Forest coast. *Acta Bot. Bras.* 26, 735–747.
- Carvalho, A.C.D., 2003. Feiticeiros, burlões e mistificadores: criminalidade e mudança nas práticas populares de saúde em São Paulo, 1950 a 1980. Editora UNESP, São Paulo.
- Chaves, T.G.L.B., 2013. Fala natureza! Teu intérprete te escuta! (Literatura e meio ambiente em Guimarães J.G. Rosa). Editora CRV, Curitiba, pp. 135.
- Desmarchelier, C., 2010. Neotropics and natural ingredients for pharmaceuticals: why isn't South American biodiversity on the crest of the wave? *Phytother. Res.* 24, 791–799.
- Fagg, C.W., Lughadha, E.N., Milliken, W., Hind, D.N., Brandão, M.G.L., 2014. Useful Brazilian plants listed in the manuscripts and publications of the Scottish medic and naturalist George Gardner (1810–1849). *J. Ethnopharmacol.* 161, 18–29.
- Feuereisen, M.M., Hoppe, J., Zimmermann, B.F., Weber, F., Schulze-Kaysers, N., Schieber, A., 2014. Characterization of phenolic compounds in Brazilian pepper (*Schinus terebinthifolius* Raddi) Exocarp. *J. Agric. Food Chem.* 62, 6219–6226.
- Heinrich, M., Kufer, J., Leonti, M., Pardo-de-Santayana, M., 2006. Ethnobotany and ethnopharmacology – interdisciplinary links with the historical sciences. *J. Ethnopharmacol.* 107, 157–160.
- Lima, I.L.P., Scariot, A., Medeiros, M.B., Sevilha, A.C., 2012. Diversidade e uso de planta do Cerrado em comunidade de Geraizeiros no norte do estado de Minas Gerais, Brasil. *Acta Bot. Bras.* 26, 675–684.
- López-Muñoz, F., Alamo, C., García-García, P., 2006. “The herbs that have the property of healing”: the phytotherapy in Don Quixote. *J. Ethnopharmacol.* 106, 429–441.
- Martinelli, L.A., Joly, A.A., Nobre, C.A., Sparovek, G., 2010. A falsa dicotomia entre a preservação da vegetação natural e a produção agropecuária. *Biota Neotrop.* 10, 323–330.
- Medeiros, M.F.T., 2008. Historical Ethnobotany: an approach through historical documents and their implications now days. In: Albuquerque, U.P., Hanzaki, N. (Eds.), *Recent Development and Case Studies in Ethnobotany*. Brazilian Society of Ethnobiology and Ethnoecology, Recife, pp. 127–142.
- Medeiros, P.M., Ladio, A.H., Albuquerque, U.P., 2013. Patterns of medicinal plant use by inhabitants of Brazilian urban and rural areas: a macroscale investigation based on available literature. *J. Ethnopharmacol.* 150, 729–746.
- Meyer, M., 2008. *Ser-tão Natureza. A natureza em Guimarães Rosa*. Editora da UFMG, Belo Horizonte.
- Mittermeier, R.A., Fonseca, G.A.B., Rylands, A.B., Brandon, K., 2005. A brief history of biodiversity conservation in Brazil. *Conserv. Biol.* 19, 601–607.
- Oliveira, V.B., Versiani, A., Oliveira, M., Teixeira, M., Brandão, M.G.L., 2014. Effects of *Xylopia aromatica* (Lam.) Mart. fruit on metabolic and inflammatory dysfunction induced by high refined carbohydrate-containing-diet in mice. *Food Res. Int.* 62, 541–550.
- Oliveira, L.M., Bevilacqua, C.M., Macedo, I.T., Morais, S.M., Monteiro, M.V., Campello, C.C., Ribeiro, W.L., Batista, E.K., 2011. Effect of six tropical tanniferous plant extracts on larval exsheathment of *Haemonchus contortus*. *Rev. Bras. Parasitol.* 20, 155–160.
- Rennó, L.R., 1970. Vegetais que a Bíblia citou. *Oreades* 1, 17–20.
- Rizzo, J.A., Campos, I.F.P., Jaime, M.C., Munhoz, G., Morgado, M.F., 1999. Utilização de plantas medicinais nas cidades de Goiás e Pirenópolis, Estado de Goiás. *Rev. Bras. Cien. Farm.* 20, 431–447.
- Rodrigues, V.E.G., Carvalho, D.A., 2007. Levantamento etnobotânico de plantas medicinais no domínio dos cerrados na região do Alto Rio Grande – Minas Gerais. *Rev. Bras. Plantas Med.* 19 (2), 17–35.
- Rosa, J.G., 1986. *Grande sertão: veredas*, 36th ed. Nova Fronteira, Rio de Janeiro.
- Rosa, J.G., 1984a. *Manuelzão e Miguilim*, 9th ed. Nova Fronteira, Rio de Janeiro.
- Rosa, J.G., 2001a. *Noites do sertão*, 9th ed. Nova Fronteira, Rio de Janeiro.
- Rosa, J.G., 2001b. *No Urubuquaquá, no Pinhém*, 9th ed. Nova Fronteira, Rio de Janeiro.
- Rosa, J.G., 1988. *Primeiras Estórias*, 47ª impressão. Nova Fronteira, Rio de Janeiro.
- Rosa, J.G., 1984b. *Sagarana*, 31st ed. Nova Fronteira, Rio de Janeiro.
- Rosa, J.G., 1985. *Tutaméia (Terceiras Estórias)*, 6th ed. Nova Fronteira, Rio de Janeiro.
- Saklani, A., Kutty, S.K., 2008. Plant derived compounds in clinical trials. *Drug Discov. Today* 13, 161–171.
- Silva, N.C., Barbosa, L., Seito, L.N., Fernandes, A., 2012. Antimicrobial activity and phytochemical analysis of crude extracts and essential oils from medicinal plants. *Nat. Prod. Res.* 26, 1510–1514.
- Silva-Júnior, M.C., 2005. *100 Árvores do Cerrado: Guia de Campo*. Rede de Sementes do Cerrado, Brasília.
- Silva-Júnior, M.C., Pereira, B.A.S., 2009. *Mais 100 Árvores do Cerrado – Matas de Galeria: Guia de Campo*. Rede de Sementes do Cerrado, Brasília.
- Telles, M.F.P., 2007. O registro como forma de proteção do patrimônio cultural imaterial. *Revista CPC* 4, 40–71.
- Temponi, V.S., Silva, J.B., Alves, M.S., Ribeiro, A., Jesus, R.G.P.J., Yamamoto, C.H., Pinto, M.A., Del-Vechio, V.G., Vieira-Sousa, O.V., 2012. Antinociceptive and anti-inflammatory effects of ethanol extract from *Vernonia polyanthes* leaves in rodents. *Int. J. Mol. Sci.* 13, 3887–3899.
- Vila-Verde, G.M., Paula, J.R., Caneiro, D.M., 2003. Levantamento etnobotânico das plantas medicinais do Cerrado utilizadas pela população de Mossâmedes (GO). *Rev. Bras. Farmacogn.* 13 (Suppl.), 64–66.