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Medicinal plants for the "nerves": a review of ethnobotanical studies carried out in South Brazil

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ABSTRACT

Among the medicinal purposes for which plants have been used is the treatment of "nerves". The objective of this study was to search for species of plants used in the state of Rio Grande do Sul (South Brazil) for the relief of symptoms related to central nervous system (CNS) disorders. Twenty-seven ethnobotanical studies were compiled, in which a total of 94 species were cited. The five most cited species were *Cymbopogon citratus* (81.5 %), *Melissa officinalis* (77.7 %), *Aloysia citriodora* (66.6 %), *Matricaria chamomilla* (62.9 %) and *Passiflora edulis* (51.8 %). Scientific studies have corroborated the popular use of these plants as sedatives, but most studies are preclinical and very few have been clinical (*M. chamomilla* and *M. officinalis*), and these were mainly exploratory or were performed against placebo. In addition to efficacy data, there are also indications of toxicity for *M. chamomilla* and *P. edulis*. In conclusion, there is a great diversity of plant species used in the treatment of symptoms related to CNS disorders, and they are most frequently used as a sedative. Data indicate that *M. officinalis* possesses clinical efficacy in the treatment of symptoms associated with anxiety without signs of toxicity.

Keywords: central nervous system disorders, ethnobotany, popular medicine, sedative, toxicity

Introduction

Brazil is rich in ethnic and cultural diversity and holds valuable traditional knowledge associated with the use of herbal medicines (Brasil 2006). Such popular medicine is widespread in the South Region of the country, especially in rural areas where the population faces difficulties in accessing primary care services (Souza *et al.* 2004) and uses alternative therapeutic resources including medicinal plants. Consumption is also favored by a widespread popular belief that medicinal plants and byproducts do not present adverse effects or toxicity, and thus are beneficial and safe products for health (Mengue *et al.* 2001). However, there is also evidence that plants may be toxic and that in certain situations even plants considered safe may cause adverse (in some cases, serious) events or loss of efficacy (Moreira *et al.* 2014; Lorenzo *et al.* 2015). Thus, knowledge about the use, pharmacological properties and toxicology of plants and products derived from them is fundamental to assure their safety and effectiveness (Rates 2001; Moreira *et al.* 2014; Lorenzo *et al.* 2015; Braga *et al.* 2017). The main objective of ethnobotanical research is to recover knowledge and the use of medicinal plants in communities (Rodrigues *et al.* 2011). Besides being important for the acquisition of knowledge of the flora and for preserving the cultural identity of communities, such studies also provide important elements for the rational and sustainable use

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of these resources, including the development of herbal medicines and the discovery of bioactive molecules, with consequent drug development (Rates 2001; Braga *et al.* 2017). In fact, many drugs used in current therapy were originally obtained or developed from plant products (Cragg & Newman 2013).

Previous compilations of ethnobotanical surveys conducted in the Brazilian state of Rio Grande do Sul focused on plants used for the treatment of diabetes (Trojan-Rodrigues *et al.* 2012) and pain (Stolz *et al.* 2014) and demonstrated that the use of medicinal plants is a widespread practice in the state. Neverthless, no compilation has been performed for plants used for the relief of symptoms related to central nervous system (CNS) disorders cited in ethnobotanical surveys in Rio Grande do Sul. Such plants are popularly denominated as medicinal plants for the "nerves".

Knowledge of the use of plants in popular medicine for treating CNS disorders is relevant, given the epidemiology of these diseases and the difficulty in establishing effective and safe pharmacological therapies. About 5.8 % of the Brazilian population lives with depression, and it has the greatest prevalence of anxiety disorders among countries of the world, with about 9.3 % of the population (WHO 2017).

There are different pharmacological treatments for depressive disorders and anxiety. However, the available therapeutic arsenal has important limitations: benzodiazepine anxiolytics cause dependence and develop tolerance (Rates & Salles 2012; Murrough *et al.* 2015); antidepressants have low adherence due to adverse effects and long latency, about 30 uninterrupted days, to treatment efficacy. In addition, about 33 % of patients do not respond to antidepressants (Stahl 2014; Murrough *et al.* 2015). The contribution of plants to the development of drugs for the treatment of mental disorders can be exemplified by the species *Rauwolfia serpentina*, from which reserpine was isolated; although now in disuse, this drug was important in the early stages of the pharmacological treatment of schizophrenia. Species such as *Hypericum perforatum* and *Piper methysticum*, currently serve as raw material for the production of herbal medicines for the treatment of depression and anxiety, respectively. *Valeriana officinalis*, a species with millennial use, is recgonized by WHO as a sedative in replacement of benzodiazepines (WHO 2017).

Studies involving the use of plants to treat some CNS dysfunctions have been undertaken in different cultures, such as Andean (Lozada *et al.* 2006; Vidaurre *et al.* 2006; Bussmann *et al.* 2010), Mexican (Gutierrez *et al.* 2014), Spanish (Calvo & Cavero 2015) and Iranian (Saki *et al.* 2014) peoples. Many species of plants are used to treat some CNS dysfunctions in Brazil, as evidenced by the large number of herbal medicines registered by the National Health Surveillance Agency (ANVISA): about 146 used to treat mood disorders, approximately 80 simple herbal medicines, and 66 herbal compounds (Montezolli & Lopes 2015).

In this context, the objective of the present work was to compile plants used to treat symptoms related to mental disorders, such as depression and anxiety, mentioned in ethnobotanical studies carried out in the state of Rio Grande do Sul, and to perform a bibliographic survey of chemical, biological and toxicity data of the most cited species.

Materials and methods

The compiled etnonobotanical studies were found by performing searches within virtual databases (PubMed - http//www.pubmed.com, SciELO - http//www.SciELO.org/php/index.php and Portal de Periódicos CAPES - http//www.periodicos.capes.gov.br), using the following keywords: folk medicine, medicina popular, ethnobotany, and etnobotânica combined with Rio Grande do Sul, South Brazil and sul do Brasil. Regional university libraries were also surveyed.

The criteria for selecting ethnobotanical studies were: publication up to and including 2017, accessibility, presence of at least one citation of a plant species used to treat CNS disorders (tranquilizer, sedative, for nerves, depression, anxiety, nervousness). In addition, studies were only considered if authored by at least one botanist or if they mentioned plant identification by a botanist(s). Thusly, a total of 27 ethnobotanical studies performed in Rio Grande do Sul were consulted. These studies took place in different physiographic regions of Rio Grande do Sul as defined by Fortes (1959): Alto Uruguai - Battisti *et al.* (2013), Kubo (1997), Löwe (2004); Campanha - Löbler *et al.* (2014); Campos de Cima da Serra - Ritter *et al.* (2002); Depressão Central - Baldauf *et al.* (2009), Koch (2000), Possamai (2000), Soares *et al.* (2004), Somavilla & Canto-Dorow (1996), Souza (2007), Vendruscolo & Mentz (2006); Encosta do Sudeste - Borba (2008), Ceolin *et al.* (2009), Martha (2003), Veiga (2003), Zanandrea (2003); Encosta Inferior do Nordeste - Barbosa (2005), Sebold (2003); Encosta Superior do Nordeste - Piva (1998); Litoral - Borges (2010), Froehlich (1998), Sperry *et al.* (1999); Missões - Barros *et al.* (2007); Planalto Médio - Garlet & Irgang (2001); and Serra do Sudeste - Fernandes (2001), Leitzke (2003).

Plant popular names cited in the original studies were preserved in the current work. The origin (native of Rio Grande do Sul or exotic), valid scientific names and possible synonymies of each plant were obtained from the databases of Flora do Brasil (2018), The Plant List (2018) and Tropicos (http://www.mobot.org). The botanical families were updated according to the APG IV (2016). The habit and form of preparation, as they are given in the studies, were compiled. Terms such as infusion and decoction were standardized as "tea". Citation frequency was calculated as follows: number of studies that cite the species ×(100)/total number of studies.

The species cited in more than half of the compiled ethnobotanical studies were selected for further searches

for scientific data about chemical constitution, biological properties and evidence of toxicity. For this, clinical and preclinical studies were searched in the PubMed (http//www.pubmed.com), SciELO (http//www.SciELO.org/php/index.php), Scopus (https://www.scopus.com/home.uri) and Portal de Periódicos CAPES (http//www.periodicos.capes.gov.br). The scientific name of the plant was combined with the terms "depression", "sedative", "anxiety", "nervousness", "biological activity", "chemical composition" and "toxicity", as well as their corresponding words in Portuguese, and used as keywords in the searches.

Results and discussion

Twenty-seven ethnobotanical studies were assessed. The studies were performed in municipalities located in different physiographic regions of Rio Grande do Sul. The Depressão Central was the region with the greatest number of studies (07), which is likely due to its proximity to the most important universities. It should be noted that currently the Fortes's classification (Fortes 1959) is mainy of historical value. In fact, the diversity of climate, soil and landforms in Rio Grande de Sul generates distinct ecosystems included in two biomes: the Atlantic Forest and the Pampa. The Atlantic Forest biome is characterized by the predominance of forest vegetation. It originally encompassed about 37 % of the state of Rio Grande do Sul, occupying the northern half of the state, although only 7.5 % of the area of the biome in the state remains, with high a degree of fragmentation relative to the original vegetation cover (Brasil 2018a; Rio Grande do Sul 2018). The Pampa biome in Brazil is restricted to the southern half of Rio Grande do Sul, and encompasses over 63% of the state. This biome is characterized by the predominance of a set of lowland vegetation that extends through Uruguay and Argentina, and possesses a great diversity of fauna and flora that is still poorly known (Brasil 2018a; Rio Grande do Sul 2018).

Ninety-four plant species were indicated to treat CNS dysfunctions (Tab. 1). Reports that provided only the genus or popular name were not considered. The families with the greatest number of species cited were Lamiaceae, with twenty-four species, Asteraceae, with thirteen species, and Rutaceae, with eight species.

Out of all the species cited (94), 73.4 % (69 species) were exotic and 26.6 % (25 species) were native to Rio Grande do Sul. This finding differs somewhat from that reported by Trojan-Rodrigues *et al.* (2012) and Stolz *et al.* (2014), who found parity in the popular use of native and exotic plants for treating diabetes and pain, respectively. The use of exotic species, which are frequently cultivated in domestic gardens, points to the influence of different cultures coming from several ethnic groups. European, Asian and African descendants have integrated with indigenous peoples in Brazil, which is responsible for originating the current tradition of popular use of medicinal plants in the country (Ceolin *et al.* 2009; Battisti *et al.* 2013; Löbler *et al.* 2014).

Regarding plant habit, 50.0 % (47 species) of the species were herbaceous, 21.3 % (20 species) arboreal, 19.1 % (18 species) shrubby and 9.6 % (nine species) climbing. About 60 % of the cited species had their leaves used while 17 % had the flowers or inflorescences used. These data are in agreement with other ethnobotanical studies of medicinal plants, which also found the flora to be mostly of herbaceous habit, a common occurrence for the Atlantic Forest biome. The commonality of the herbaceous habit may be related to the traditional practice of cultivation in backyards, since small plants are more easily cultivated in these smaller areas and backyard cultivation facilitates access to plants (Medeiros *et al.* 2004; Pinto *et al.* 2006; Giraldi & Hanazaki 2010). The use of leaves is predominant in Rio Grande do Sul since they are abundantly availability in the typical vegetation of southern Brazil, while the use of other plant parts is more characteristic of other regions, such as the Cerrado and Caatinga biomes, where the availability of leaves is more limited (Baldauf *et al.* 2009). The form of preparation cited for treating CNS dysfunctions for all species was tea (including decoction and infusion), although several speices were cited for other uses including as food and as a conndiment. Tea was also the predominant form of preparation cited in research on general medical use (Trojan-Rodrigues *et al.* 2012; Stolz *et al.* 2014).

Five species were cited in more than half of the studies surveyed: *Cymbopogon citratus*, with a 81.5 % citation frequency; *Melissa officinalis*, with 77.7 %; *Aloysia citriodora*, with 66.6 %; *Matricaria chamomilla*, with 62.9 %, and *Passiflora edulis*, with 51.8 %. Of these, only *P. edulis* is native to the study area. The use indicated for these five most cited species was as a sedative. *Cymbopogon citratus*, *M. officinalis* and *M. chamomilla* have been used as sedatives in other regions of Brazil, such as the states of Mato Grosso (Bieski *et al.* 2012), Minas Gerais (Costa & Mayworm 2011), Rio de Janeiro (Medeiros *et al.* 2004), and Rondônia (Santos *et al.* 2008). Indigenous peoples of Tocantins (Rodrigues & Carlini 2006) and quilombolas communities of Mato Grosso (Rodrigues & Carlini 2003) use *C. citratus* as a sedative. Indigenous communities living in cerrado savannahs and/or Pantanal wetlands use *M. officinalis* "to calm nervs" (Rodrigues & Carlini 2006). *C. citratus*, *M. officinalis*, *M. chamomilla* and *P. edulis* are used for the tratament of "nervios", anxiety and depression in Mexico (Gutiérrez *et al.* 2014), while *M. officinalis* and *M. chamomilla* are used for psychosomatic disorders in Peru (Bussmann *et al.* 2010).

Cymbopogon citratus is indicated by the Formulário de Fitoterápicos da Farmacopéia Brasileira (Pharmacotherapeutic Formulary of the Brazilian Pharmacopoeia) as an antispasmodic, anxiolytic and mild sedative, and that it may potentiate the effect of sedative

Table 1. Medicinal plants used as antidepressants. tranquilizers or sedatives. mentioned in the ethnobotanical surveys carried out in Southern Brazil. Origin: E=exotic, N=native, Habit: C=climber, H=herb, S=shrub, T=tree.

Frequency	Species / Family / Popular name	Origin	Habits	Prepare form	References
81.5 %	*Cymbopogon citratus* (DC.) Stapf/ Poaceae/ Capim-cidró, cidreira, capim-cidrão	E	H	Tea (leaf)	Somavilla & Canto-Dorow (1996); Kubo (1997); Piva (1998); Possamai (2000); Garlet & Irgang (2001); Ritter *et al.* (2002); Leitzke (2003); Martha (2003); Sebold (2003); Veiga (2003); Zanandrea (2003); Löwe (2004); Soares *et al.* (2004); Vendruscolo & Mentz (2006); Barros *et al.* (2007); Souza (2007); Borba (2008); Baldauf *et al.* (2009); Ceolin *et al.* (2009); Borges (2010); Battisti *et al.* (2013); Löbler *et al.* (2014)
77.7 %	*Melissa officinalis* L./ Lamiaceae/ Melissa, cidreira, erva-cidreira	E	H	Tea (aerial parts)	Somavilla & Canto-Dorow (1996); Kubo (1997); Piva (1998); Koch (2000); Possamai (2000); Garlet & Irgang (2001); Leitzke (2003); Martha (2003); Sebold (2003); Veiga (2003); Zanandrea (2003); Löwe (2004); Soares *et al.* (2004); Vendruscolo &Mentz (2006); Barros *et al.* (2007); Souza (2007); Borba (2008); Ceolin *et al.* (2009); Borges (2010); Battisti *et al.* (2013); Löbler *et al.* (2014)
66.6 %	*Aloysia citriodora* Palau/ Verbenaceae/ Cidrozinho, cidró, cidreira	E	S	Tea (aerial parts)	Somavilla & Canto-Dorow (1996); Kubo (1997); Froehlich (1998); Piva (1998); Koch (2000); Possamai (2000); Garlet & Irgang (2001); Ritter *et al.* (2002); Leitzke (2003); Sebold (2003); Soares *et al.* (2004); Barbosa (2005); Vendruscolo & Mentz (2006); Barros *et al.* (2007); Souza (2007); Borba (2008); Baldauf *et al.* (2009); Borges (2010)
62.9 %	*Matricaria chamomilla* L./ Asteraceae/ Camomila, maçanilha	E	H	Tea (inflorescences)	Somavilla & Canto-Dorow (1996); Froehlich (1998); Piva (1998); Possamai (2000); Garlet & Irgang (2001); Leitzke (2003); Martha (2003); Sebold (2003); Veiga (2003); Zanandrea (2003); Löwe (2004); Soares *et al.* (2004); Barros *et al.* (2007); Ceolin *et al.* (2009); Battisti *et al.* (2013); Borba (2008); Löbler *et al.* (2014)
51.8 %	*Passiflora edulis* Sims/ Passifloraceae/ Maracujá, maracujá-de-casa	N	C	Tea, food	Froehlich (1998); Piva (1998); Possamai (2000); Garlet & Irgang (2001); Ritter *et al.* (2002); Leitzke (2003); Martha (2003); Sebold (2003); Zanandrea (2003); Soares *et al.* (2004); Vendruscolo & Mentz (2006); Barros *et al.* (2007); Souza (2007); Löbler *et al.* (2014)
44.4 %	*Citrus sinensis* (L.) Osbeck/ Rutaceae/ Laranjeira, Laranja, laranja-comum	E	T	Tea, food	Somavilla & Canto-Dorow (1996); Kubo (1997); Piva (1998); Possamai (2000); Ritter *et al.* (2002); Martha (2003); Sebold (2003); Soares *et al.* (2004); Barbosa (2005); Borba (2008); Ceolin *et al.* (2009); Battisti *et al.* (2013)
40.7 %	*Rosmarinus officinalis* L./ Lamiaceae/ Alecrim, alecrim-da-horta	E	S	Tea, condiment	Somavilla & Canto-Dorow (1996); Kubo (1997); Piva (1998); Possamai (2000); Garlet & Irgang (2001); Leitzke (2003); Löwe (2004); Barbosa (2005); Barros *et al.* (2007); Souza (2007); Battisti *et al.* (2013)
37.0 %	*Passiflora alata* Curtis/ Passifloraceae/ Maracujá, maracujá-doce	N	C	Tea (leaf), food (fruit)	Somavilla & Canto-Dorow (1996); Kubo (1997); Piva (1998); Garlet & Irgang (2001); Veiga (2003); Löwe (2004); Soares *et al.* (2004); Barbosa (2005); Vendruscolo & Mentz (2006); Barros *et al.* (2007)
33.3 %	*Citrus reticulata* Blanco/ Rutaceae/ Bergamoteira	E	T	Tea (leaf)	Somavilla & Canto-Dorow (1996); Kubo (1997); Possamai (2000); Garlet & Irgang (2001); Löwe (2004); Barros et al. (2007); Souza (2007); Borges (2010); Battisti *et al.* (2013)
29.6 %	*Lactuca sativa* L./ Asteraceae/ Alface, alface-crespa, alface-lisa	E	H	Tea, food	Piva (1998); Possamai (2000); Garlet & Irgang (2001); Ritter *et al.* (2002); Leitzke (2003); Soares *et al.* (2004); Borba (2008); Ceolin *et al.* (2009)
25.9 %	*Lippia alba* (Mill.) N.E.Br. ex Britton & P.Wilson/ Verbenaceae/ Sálvia, sálvia-do-rio-grande	N	S	Tea	Leitzke (2003); Martha (2003); Zanandrea (2003); Löwe (2004); Barbosa (2005); Vendruscolo & Mentz (2006); Barros *et al.* (2007)

Table 1. Cont.

Frequency	Species / Family / Popular name	Origin	Habits	Prepare form	References
25.9 %	*Salvia officinalis* L./ Lamiaceae/ Sálvia	E	H	Tea, condiment	Kubo (1997); Leitzke (2003); Martha (2003); Sebold (2003); Zanandrea (2003); Löwe (2004); Battisti *et al.* (2013)
22.2 %	*Aloysia gratissima* (Gillies & Hook.)Tronc./ Verbenaceae/ Erva-santa, canelinha, erva-cidreira	N	S	Tea	Froehlich (1998); Koch (2000); Possamai (2000); Souza (2007); Ceolin *et al.* (2009); Borges (2010)
22.2 %	*Citrus aurantiifolia* (Christm.) Swingle/ Rutaceae/ Limeira, lima, limão	E	T	Tea, food	Piva (1998); Possamai (2000); Garlet & Irgang (2001); Soares *et al.* (2004); Barros *et al.* (2007); Borba (2008)
18.5 %	*Achyrocline satureioides* (Lam.) DC./ Asteraceae/ Macela, marcela	N	H	Tea	Somavilla & Canto-Dorow (1996); Possamai (2000); Leitzke (2003); Vendruscolo & Mentz (2006); Borges (2010)
18.5 %	*Lavandula angustifolia* Mill./ Lamiaceae/ Alfazema, alfazema-miúda	E	H	Tea, condiment	Kubo (1997); Piva (1998); Leitzke (2003); Soares *et al.* (2004); Borba (2008)
18.5 %	*Mentha pulegium* L./ Lamiaceae/ Melissa, melissa-miudinha	E	H	Tea	Leitzke (2003); Martha (2003); Sebold (2003); Löwe (2004); Vendruscolo & Mentz (2006)
18.5 %	*Ocimum basilicum* L./ Lamiaceae/ Manjericão, manjericão-de-folha-estreita	E	S	Tea, condiment	Somavilla & Canto-Dorow (1996); Piva (1998); Possamai (2000); Barbosa (2005); Vendruscolo & Mentz (2006)
18.5 %	*Ocimum carnosum* (Spreng.) Link & Otto ex Benth./ Lamiaceae/ Anis, gervão, alfavaca	E	S	Tea, condiment	Somavilla & Canto-Dorow (1996); Possamai (2000); Soares *et al.* (2004); Vendruscolo & Mentz (2006); Borges (2010)
14.8 %	*Citrus × aurantium* L./ Rutaceae/ Laranjeira-amarga	E	T	Tea, food	Froehlich (1998); Possamai (2000); Leitzke (2003); Löwe (2004)
14.8 %	*Cunila microcephala* Benth./ Lamiaceae/ Poejo, poejo-graúdo	N	H	Tea	Koch (2000); Vendruscolo & Mentz (2006); Ceolin *et al.* (2009); Battisti *et al.* (2013)
14.8 %	*Mentha spicata* L./ Lamiaceae/ Hortelã, hortelã-miudinha	E	H	Tea	Kubo (1997); Piva (1998); Ritter *et al.* (2002); Soares *et al.* (2004)
14.8 %	*Origanum majorana* L./ Lamiaceae/ Manjerona	E	H	Tea, condiment	Somavilla & Canto-Dorow (1996); Piva (1998); Martha (2003); Battisti *et al.* (2013)
11.1 %	*Eugenia uniflora* L./ Myrtaceae/ Pitanga	N	T	Tea, food	Somavilla & Canto-Dorow (1996); Leitzke (2003); Barros *et al.* (2007)
11.1 %	*Mentha × piperita* L./ Lamiaceae/ Hortelã-pimenta, alevante	E	H	Tea	Leitzke (2003); Vendruscolo & Mentz (2006); Barros *et al.* (2007)
11.1 %	*Salvia microphylla* Kunth/ Lamiaceae/ Pronto-alívio, ponto-alívio	E	H	Tea	Soares *et al.* (2004); Barros *et al.* (2007); Battisti *et al.* (2013)
11.1 %	*Sechium edule* (Jacq.) Sw./ Cucurbitaceae/ Chuchu	E	C	Tea	Somavilla & Canto-Dorow (1996); Leitzke (2003); Löwe (2004)
7.4 %	*Aristolochia triangularis* Cham./ Aristolochiaceae/ Cipó-mil-homens	N	C	Tea	Sperry *et al.* (1999); Leitzke (2003)
7.4 %	*Artemisia alba* Turra/ Asteraceae/ Alcanfor	E	H	Tea	Martha (2003); Sebold (2003)
7.4 %	*Campomanesia xanthocarpa* (Mart.) Berg./ Myrtaceae/ Guabiroba, guabirobeira	N	T	Tea, food	Kubo (1997); Piva (1998)
7.4 %	*Citrus limon* (L.) Osbeck/ Rutaceae/ Lima	E	T	Tea, food	Kubo (1997); Martha (2003)
7.4 %	*Citrus medica* L./ Rutaceae/Lima	E	T	Tea, food	Leitzke (2003); Sebold (2003)
7.4 %	*Foeniculum vulgare* Mill/ Apiaceae/ Funcho	E	H	Tea	Piva (1998); Soares *et al.* (2004)
7.4 %	*Impatiens walleriana* Hook.f./ Balsaminaceae/ Beijinho, maria-sem-vergonha	E	H	Tea	Garlet & Irgang (2001); Vendruscolo & Mentz (2006)
7.4 %	*Leucanthemum vulgare* (Vaill.) Lam./ Asteraceae/ Margarida	E	H	Tea	Kubo (1997); Soares *et al.* (2004)
7.4 %	*Malva parviflora* L./ Malvaceae/ Malva	E	H	Tea	Piva (1998); Barros *et al.* (2007)
7.4 %	*Mentha x rotundifolia* (L.) Huds./ Lamiaceae/ Hortelã, alevante	E	H	Tea	Garlet & Irgang (2001); Zanandrea (2003)

Table 1. Cont.

Frequency	Species / Family / Popular name	Origin	Habits	Prepare form	References
7.4 %	*Mentha* × *villosa* Huds./ Lamiaceae/ Hortelã, ponto-alívio	E	H	Tea	Soares *et al.* (2004); Battisti *et al.* (2013)
7.4 %	*Origanum* × *paniculatum* W.D.J. Koch/ Lamiaceae/ Manjerona	E	H	Tea, condiment	Garlet & Irgang (2001); Soares *et al.* (2004)
7.4 %	*Passiflora caerulea* L./ Passifloraceae/ Maracujá	N	C	Tea, food	Martha (2003); Ceolin *et al.* (2009)
7.4 %	*Pimpinella anisum* L./ Apiaceae/ Erva-doce	E	H	Tea	Somavilla & Canto-Dorow (1996); Löbler *et al.* (2014)
7.4 %	*Psidium cattleianum* Afzel. ex Sabine/ Myrtaceae/ Araçá	N	T	Tea, food	Kubo (1997); Possamai (2000)
3.7 %	*Achillea millefolium* L./ Asteraceae/ Ponto-alívio, mil-em-ramas	E	H	Tea	Ritter *et al.* (2002)
3.7 %	*Ageratum conyzoides* L./ Asteraceae/ Erva-de-são-joão	N	H	Tea	Ceolin *et al.* (2009)
3.7 %	*Allium cepa* L./ Amaryllidaceae/ Cebola	E	H	Tea, food	Garlet & Irgang (2001)
3.7 %	*Alpinia zerumbet* (Pers.) B.L. Burtt &R.M.Sm./ Zingiberaceae/ Cardamão	E	S	Tea, condiment	Sebold (2003)
3.7 %	*Alternanthera peruviana* (Moq.) Suess./ Amaranthaceae/ Periquito, anador	E	H	Tea	Leitzke (2003)
3.7 %	*Aristolochia cymbifera* Mart./ Aristolochiaceae/ Cipó-mil-homens	N	C	Tea	Ceolin *et al.* (2009)
3.7 %	*Asparagus densiflorus* (Kunth) Jessop/ Liliaceae/ Aspargo	E	S	Tea	Sebold (2003)
3.7 %	*Asparagus setaceus* (Kunth) Jessop/ Liliaceae/ Aspargo- trepadeira	E	S	Tea	Sebold (2003)
3.7 %	*Atropa belladonna* L./ Solanaceae/ Beladona	E	S	Tea	Borba (2008)
3.7 %	*Baccharis articulata* (Lam.) Pers./ Asteraceae/ Carqueja	N	S	Tea	Somavilla & Canto-Dorow (1996)
3.7 %	*Calyptocarpus biaristatus* (DC.) H.Rob./ Asteraceae/ Mata-pasto, erva-da-míngua	N	H	Tea	Garlet & Irgang (2001)
3.7 %	*Carya illinoinensis* (Wangenh.) K.Koch/ Juglandaceae/ Nozes	E	T	Tea, food	Fernandes (2001)
3.7 %	*Cichorium intybus* L./ Asteraceae/ Chicória	E	H	Tea, food	Leitzke (2003)
3.7 %	*Cinnamomum verum* J.Presl/ Lauraceae/ Canela	E	T	Tea, condiment	Barros *et al.* (2007)
3.7 %	*Cocos nucifera* L./ Arecaceae/ Côco-branco	E	T	Tea, food	Somavilla & Canto-Dorow (1996)
3.7 %	*Coriandrum sativum* L./ Apiaceae/ Coentro, endro	E	H	Tea, condiment	Löwe (2004)
3.7 %	*Cuphea carthagenensis* (Jacq.) J.F.Macbr./ Lythraceae/ Sete-sangrias	N	H	Tea	Leitzke (2003)
3.7 %	*Cydonia vulgaris* Pers/ Rosaceae/ Marmelo-da-índia	E	S	Tea, food	Leitzke (2003)
3.7 %	*Erythrina falcata* Benth./ Fabaceae/ Corticeira	N	T	Tea	Sperry *et al.* (1999)
3.7 %	*Erythrina speciosa* Andrews/ Fabaceae/ Mulungu	E	T	Tea	Ceolin *et al.* (2009)
3.7 %	*Erythrina verna* Vell./ Fabaceae/ Corticeira-de-jardim	E	T	Tea	Leitzke (2003)
3.7 %	*Fragaria vesca* L./ Rosaceae/ Moranguinho	E	H	Tea	Garlet & Irgang (2001)

Table 1. Cont.

Frequency	Species / Family / Popular name	Origin	Habits	Prepare form	References
3.7 %	*Gomphrena celosioides* Mart./ Amaranthaceae/ Perpétua	N	H	Tea	Leitzke (2003)
3.7 %	*Hyptis mutabilis* (Rich.) Briq./ Lamiaceae/ Cidreira-de-folha	N	S	Tea	Barros *et al.* (2007)
3.7 %	*Ipomoea batatas* (L.) Lam./ Convolvulaceae/ Batata-doce	E	H	Tea	Somavilla & Canto-Dorow (1996)
3.7 %	*Laurus nobilis* L./ Lauraceae/ Loureiro	E	T	Tea, condiment	Piva (1998)
3.7 %	*Lepidium didymum* L./ Brassicaceae/ Menstruz	N	H	Tea, food	Piva (1998)
3.7 %	*Malus sylvestris* (L.) Mill./ Rosaceae/ Macieira	E	T	Tea, food	Somavilla & Canto-Dorow (1996)
3.7 %	*Malva sylvestris* L./ Malvaceae/ Malva	E	S	Tea	Leitzke (2003)
3.7 %	*Medicago sativa* L./ Fabaceae/ Alfafa	E	H	Tea	Kubo (1997)
3.7 %	*Mentha arvensis* L./ Lamiaceae/ Hortelã-branca	E	S	Tea	Sebold (2003)
3.7 %	*Mentha suaveolens* Ehrh./ Lamiaceae/ Hortelã-branca	E	H	Tea	Battisti *et al.* (2013)
3.7 %	*Mikania laevigata* Sch.Bip. ex Baker/ Asteraceae/ Guaco-de-casa	N	C	Tea	Possamai (2000)
3.7 %	*Minthostachys mollis* (Benth.) Griseb. / Lamiaceae/ Melissa	E	H	Tea	Battisti *et al.* (2013)
3.7 %	*Momordica charantia* L./ Cucurbitaceae/ Melão-de-são-caetano	E	C	Tea, food	Vendruscolo & Mentz (2006)
3.7 %	*Monteverdia ilicifolia* (Mart. ex Reissek) Biral/ Celastraceae/ Cancorosa, espinheira-santa	N	T	Tea	Vendruscolo & Mentz (2006)
3.7 %	*Nepeta cataria* L./ Lamiaceae/ Melissa- verdadeira, melissa-cidreira	E	H	Tea	Soares *et al.* (2004)
3.7 %	*Origanum vulgare* L./ Lamiaceae/ Orégano	E	H	Tea, condiment	Löwe (2004)
3.7 %	*Passiflora foetida* L./ Passifloraceae/ Maracujá-fedorento	N	C	Tea, food	Piva (1998)
3.7 %	*Perilla frutescens* var. *crispa* (Thunb.) H.Deane/ Lamiaceae/ Manjericão-da-folha-larga-crespa	E	H	Tea	Piva (1998)
3.7 %	*Persea americana* Mill./ Lauraceae/ Abacateiro	E	T	Tea, food	Leitzke (2003)
3.7 %	*Persicaria hydropiperoides* (Michx.) Small/ Polygonaceae/ Erva-de-bicho	N	H	Tea	Piva (1998)
3.7 %	*Petiveria alliacea* L./ Phytolaccaceae/ Erva-de-guiné	N	S	Tea	Sebold (2003)
3.7 %	*Plectranthus neochilus* Schltr./ Lamiaceae/ Boldo, boldo-chileno	E	H	Tea	Borges (2010)
3.7 %	*Rosa gallica* L./ Rosaceae/ Rosa	E	S	Tea	Leitzke (2003)
3.7 %	*Ruta graveolens* L./ Rutaceae/ Arruda-miúda	E	H	Tea	Piva (1998)
3.7 %	*Ruta chalepensis* L./ Rutaceae/ Arruda-graúda	E	H	Tea	Piva (1998)
3.7 %	*Saintpaulia ionantha* H.Wendl./ Gesneriaceae/ Violeta	E	H	Tea	Zanandrea (2003)
3.7 %	*Salix babylonica* L./ Salicaceae/ Salso-chorão	E	T	Tea	Leitzke (2003)

Table 1. Cont.

Frequency	Species / Family / Popular name	Origin	Habits	Prepare form	References
3.7 %	*Symphytum officinale* L./ Boraginaceae/ Confrei	E	S	Tea	Somavilla & Canto-Dorow (1996)
3.7 %	*Tagetes erecta* L./ Asteraceae/ Cravo-de-defunto	E	H	Tea	Leitzke (2003)
3.7 %	*Thymus serpyllum* L./ Lamiaceae/ Cidrozinho, orégano	E	H	Tea	Soares *et al.* (2004)

drugs (Brasil 2011; 2016). Citral is the main chemical constituent of the volatile oil of the plant, accounting for at least 60 % of its composition (Brasil 2010). Studies have suggested that the anxiolytic effect of the essential oil of this species is mediated by the GABAA receptor-benzodiazepine complex (Costa *et al.* 2011).

Melissa officinalis has been historically used as an anxiolytic (Wong *et al.* 1998). It is indicated in the Formulário de Fitoterápicos da Farmacopéia Brasileira as an antispasmodic, anxiolytic and mild sedative, with the warning that it should not be used in cases of hypothyroidism and used with caution with people with hypotension (Brasil 2011; 2018b). According to the Brazilian Pharmacopoeia, *M. officinalis* must possess at least 4.0 % of total hydroxycinnamic derivatives, at least 2.0 % of rosmarinic acid and at least 0.6 % of volatile oil (Brasil 2010). Citral, geranial, neral and β-caryophyllene have been suggested as the main compounds responsible for actions of *M. officinalis* on the CNS (Tagashira & Ohtake 1998; Wake *et al.* 2000; Vale *et al.* 2002).

Matricaria chamomilla is among the most important medicinal plants native to southern and eastern Europe (Singh *et al.* 2011; Telesinski *et al.* 2013). Singh & Aishwarya (2017) recently published a review on the biological properties of this species. It is indicated in the Formulário de Fitoterápicos da Farmacopéia Brasileira as antispasmodic, anxiolytic and mild sedative. The formulary also includes information on occasional allergic reactions and possible occurrence of nervous excitement and insomnia in cases of overdose, and that its use should be avoided with people that are allergic or hypersensitive to chamomile or plants of the family Asteraceae (Brasil 2011). Camazulene, coumarin and trans-caryophyllene have been suggested as the compounds responsible for the effects of *M. chamomilla* on the CNS (Hajjaj *et al.* 2013; Keefe *et al.* 2016; Mao *et al.* 2016).

Passiflora edulis is indicated in the Formulário de Fitoterápicos da Farmacopéia Brasileira as an anxiolytic and mild sedative, with the warning that its use may cause somnolence and that it should not be used chronically or concomitantly with other sedatives and depressants of the nervous system (Brasil 2011; 2018b).

Aloysia citriodora is traditionally used in France as a sedative and muscle relaxant for newborns (Makram *et al.* 2015). This species is native to South America and has been cultivated into Europe since 1784 (Pio Corrêa 1931). According to Ragone *et al.* (2010), the effect of this plant is similar to the effect of benzodiazepines. Citral is its main constituent (Ponce-Monter *et al.* 2010).

Scientific studies on the efficacy of the five most frequently mentioned species (Tab. 2) are mostly preclinical; that is, they were carried out with non-human animal models (rodents, fish, crustaceans), or were cellular or biochemical tests. Among the activities demonstrated by these studies, we highlight antimicrobial, antioxidant and anti-inflammatory properties and depressant of central nervous system (mainly, sedative effect). Clinical studies (i.e., on humans) were found only for *Matricaria chamomilla* and *Melissa officinalis*. Several clinical trials have suggested a modest beneficial action by *M. chamomilla* in relieving symptoms of anxiety (Amsterdam *et al.* 2009; 2012; Zick *et al.* 2011; Keefe *et al.* 2016; Mao *et al.* 2016). A randomized double-blind clinical study of *M. officinalis* found indications of positive action for agitation and cognitive impairment in Alzheimer's patients (Akhondzadeh *et al.* 2003). Two other studies found positive action for anxiety. One, an open prospective study, indicated efficacy for insomnia and symptoms associated with stress and anxiety (Cases *et al.* 2011), while the other, a double-blind randomized placebo study, demonstrated efficacy in relieving anxiety-related heart palpitations (Alijaniha *et al.* 2015).

Indications regarding safety were found for two of the five most cited plants. Studies were found that reported genotoxicity of *Matricaria chamomilla* (Vieira *et al.* 2009; Delarmelina *et al.* 2012) and hepatobiliary and pancreatic (in rodents and humans) toxicity of *Passiflora edulis* (Maluf *et al.* 1991). These findings are matter for some concern, and indicate a need for additional research including long-term studies to establish the safety of these plants.

Conclusion

The present study demonstrates that there is a great diversity of plant species used by the population of the state of Rio Grande do Sul for treating symptoms related to disorders of the central nervous system, with use as a sedative being the most frequent indication. The use of exotic species was predominant. The five most cited species have broad traditional use as sedative agents in Brazil and Europe, four of which are accepted by the National Health Surveillance Agency (ANVISA) for

Table 2. Chemical composition, biological activities and toxicity of medicinal species with CNS action cited in at least fourteen ethnobotanical surveys.

Family/ Species	Chemical Composition	Biological Activities	Toxicity
Asteraceae *Matricaria chamomilla* L.	Composition of the essential oil: α-pinene, caryophyllene, caryophyllene oxide, bisabolol oxide, α-bisabolol, bisabolene oxide, camazulene (Borsato *et al.* 2008), α-farnesene, artemisia ketone, 3-carene, azulene, (Borsato *et al.* 2007), spatulenol, β-elemeno, limonene oxide, β-farnesene, d-nerolidol (Reis *et al.* 2011), camphene, sabinene, d-3-carene, terpinene, p-cymene, β-felandren, limonene, 1,8-cineole, benzene acetaldehyde, γ-terpinene, Z-hydrate sabinene, α-linalool, α-tujone, β-tujone, E-sabinol, camphor, borneol, 4-terpineol, α-terpineol, E-piperitol, α-cubebene, α-acetate terpinyl, α-isocomene, 26β-elemene, α-funebrene, isocharyophyllene, β-caryophyllene, E-β-farnesene, germacrene D, bicyclogermacrene , E-nerolidol (Kazemi 2014), 6-methyl-5-hepten-2-one, 1,2,4-trimethylbenzene, 3-octanol, 1,8-cineole, decanoic acid, (E) farnesene, γ-muurolene + germacrene, bisabolol oxide B, myrcene, p-cymene, (E) -β-ocimene, terpin (E) -isopropanol, olene, terpine-4-ol, carvone, γ-elemene, decanoic acid, β-bisabolene, cadinene-γ, σ-cadinene, 2-α-pinene, eucalyptol, quercetin, pregnane, linoleic acid, triacontane, lucene-2, thymol, galaxolide, benzoic acid, salicylic acid, trans-caryophyllene, terpinen-4-ol, naphthalene, α-cedrol, anisaldehyde, coumarin, α-linolenic acid, β-pinene, benzofuran, cis-β-farnesene (Hajjaj *et al.* 2013).	The crude aqueous extract of the aerial parts presented an inhibitory effect on intestinal fluid accumulation and antidiarrheal action when applied in rabbits (in vivo), antispasmodic activity in isolated rabbit jejunum (in vitro) (Mehmood *et al.* 2015), anxiolytic and protective action in the gastric system against ethanol-induced ulceration (in vivo, in rats) (Al-Hashem 2010). The hydroalcoholic extract of aerial parts, tested in vitro in blood plasma and lung tissue and in vivo in rats, presented beneficial antioxidant action in lung lesions in cases of paraquat poisoning (Ranjbar *et al.* 2014); protected from oxidative damage caused by Paraquat poisoning (in vivo, in rats) (Tavakol *et al.* 2015); presented evidence of antidepressant effect in humans with anxiety associated with depression (Amsterdam *et al.* 2012). A standardized German camomile extract containing 1.2 % of apigenin presented an anxiolytic effect in humans with Generalized Anxiety Disorder (Amsterdam *et al.* 2009). The metabolic extract showed a neuroprotective activity against tetrafluoroaluminate (AlF ind) -induced oxidative stress (Ranpariya *et al.* 2011), and cerebral ischemia in rats (Chandrashekhar *et al.* 2010), antiallergic activity (in vitro) (Chandrashekhar *et al.* 2011). The essential oil of the flower showed antioxidant and antigenotoxic activity in spermatogonia of rats in vitro (Hernández-Ceruelos *et al.* 2010); (*Aspergillus flavus, A. fumigatus, A. niger, Trichoderma harzianum and Fusarium oxysporum*) (Jamalian *et al.* 2012). The essential oil of the aerial parts presented anxiolytic, sedative and muscle relaxant effects in mice and rats (Hajjaj *et al.* 2013). Infusion of the floral chapters showed anti-inflammatory activity against phlebitis (tested in humans) (Reis *et al.* 2011). Conjugated polysaccharide, isolated from dried flowers polyphenols have antioxidant properties blood (in vitro) (Kolodziejczyk-Czepas *et al.* 2015) and anti-platelet activity (in vivo, in mice) (Bijak *et al.* 2013).	Tincture (64 % alcohol) of *Matricaria chamomilla* (at a concentration of 20 mg / ml) caused an increase of micronuclei in the bone marrow cells of rodent (in vivo) the mutagenicity cases above-clinical dosage (400 ul / d) (Delarmelina *et al.* 2012).
Lamiaceae *Melissa officinalis* L.	Chemical composition of essential oil: 6-Metil-5-heten-2-ona, linalol, citronelal, cis-crisantenol, 4,5- epóxi careno, nerol (cis-geraniol), neral (β-citral), geraniol (trans-geraniol), geranial (α-citral), methylene geraniate, geranic acid, geranyl acetate, β-caryophyllene, caryophyllene oxide (Blank *et al.* 2005), angelate of prenila, neral, geranial, epoxy-linalool (unknown isomer), neryl acetate, trans-6-hydroxy-terpineol (Brant *et al.* 2009), β-myrcene, 2,6-octadienoic, 4,5-dimethyl, pulegone, pujol, 2,6-octadienoic acid, ester3,7-dimethyl-methyl, geranyl acetate, trans-caryophyllene (Silva *et al.* 2005), 1-octen-3-ol, 6-methyl-5-hepten-2-one, trans-β-ocimene, para-ment-3-en-8-ol, citronellol, α-cubebene, eugenol, germacrene, eugenol acetate (Sadraei *et al.* 2003), methyl citronellate, geraniol, geranyl acetate, geranic acid, α-humulene, γ-cadinene, germacrene D, cadine-3,9-diene, β-caryophyllene oxide, humulene oxide (Patora *et al.* 2003). It presents about 0.5 % of phenolic compounds in leaves, such as luteolin glycosides, quercetin, caffeic acid and rosmarinic acid (Müzell 2006).	The aqueous extract showed anti-inflammatory action in rats (in vivo) (Müzell 2006), and antioxidant properties (in rats, in vivo) (Martins *et al.* 2012). The lyophilized aqueous extract of the leaves reduced the frequency of palpitation episodes and anxiety in humans (Alijaniha *et al.* 2015). The ethanolic extract presented antidepressive property (in rats, in vivo) (Taiwo *et al.* 2012) and beneficial effect on agitation, cognitive function and mood healthy individuals and in Alzheimer's patients (Akhondzadeh *et al.* 2003; Kennedy *et al.* 2002; Wake *et al.* 2000). The hydroalcoholic extract of the leaves diminished the effects related to stress, such as anxiety, insomnia in humans (Cases *et al.* 2011), and presented antinociceptive effect and sedative action in rats (in vivo) (Soulimani *et al.* 1991). The essential oil of leaves of *M. officinalis* showed anti-inflammatory activity in rats (in vivo) (Bounihi *et al.* 2013); antibacterial and antifungal activity in a multidrug resistant strain of *Shigella sonei* and in *Trichophyton* species, respectively (Mimica-Dukic *et al.* 2004); antioxidant and antitumor (in human and rat tumor cell lines) (Sousa *et al.* 2004); inhibitor of gastrointestinal spasms, in ileum isolated from rats (Sadraei *et al.* 2003); antiviral (herpes virus) (in vitro, in monkey kidney cells) (Schnitzler *et al.* 2008). Volatile essential oil compounds and plant extracts showed antiviral activity against herpes simplex virus type two (HSV-2) (in vitro) (Allahverdiyev *et al.* 2004; Wölbling & Leonhardt 1994).	No toxicity data were found.

Table 2. Cont.

Family/ Species	Chemical Composition	Biological Activities	Toxicity
Passifloraceae *Passiflora edulis* Sims	Composed of alkaloids, saponins and mainly polyphenols (Rudnicki 2005), the essential oil of the fruit, including seeds, contains high levels of unsaturated fatty acids (87.59 %), mainly linoleic (73.14 %) and oleic acids (13.83 %), tocopherol (499.30 mg / kg) and phenolic compounds, the fatty acid being also composed of myristic, palmitic, palmitoleic, margalic, stearic, oleic, linoleic, linolenic, arachidic, eicosenoic and behenic acids. The major tocopherols in passion fruit seed oil were γ-and δ-tocopherol (Malacrida & Jorge 2012), 5-hydroxymethylfurfural, galacturonic acid, p-hydroxybenzoic acid, syringic acid, caffeic acid, p-coumaric acid, tryptophan, flavonoid glycosides, synapic acid, ferulic acid, o-coumaric acid (Talcott *et al*. 2003) β-sitosterol, stigmasterol, campesterol (Giuffré 2007), β-cryptoxanthin, prolycopene, neurosporene, γ-carotene, cis-ζ-carotene, ζ-carotene, β-carotene + phytofluene, 13-cis-β-carotene and phytoene (Silva & Mercadante 2002).	The hydroalcoholic extract of the leaves presented an antioxidant effect in rats (in vitro, in vivo and ex vivo) (Rudnicki 2005), cicatrizant in rat bladders (in vitro) (Gonçalves Filho *et al*. 2006) and positively influenced the cicatrization of anastomoses in rats (Bezerra *et al*. 2006). It was found that the extracts present a significant effect on the central nervous system (in preclinical studies with rodents and clinicians) (Maluf *et al*. 1991). The methanolic extract of the leaves presented a diuretic effect in rats (in vivo) (Armas *et al*. 2009). The methanolic extract of passion fruit peels showed antioxidant activity (Zeraik *et al*. 2012). Peel flour has been shown to reduce total cholesterol and LDL cholesterol levels, but did not alter HDL cholesterol levels (in humans) (Ramos *et al*. 2007). The extract obtained from leaves by percolation showed to be depressant of the central nervous system in mice (Bruschi *et al*. 2002). Bark flour presented positive action on glycemic control in patients with Type 2 Diabetes Mellitus (Janebro *et al*. 2008). Hydroalcoholic and aqueous extracts of the leaves had anxiolytic effect in the high cross labyrinth in rats (Petry *et al*. 2001; De-Paris *et al*. 2002).	The aqueous extract of the leaves showed hepatobiliary and pancreatic toxicity in rodents and in humans (Maluf *et al*. 1991).
Poaceae *Cymbopogon citratus* (DC.) Stapf	Compound 6-methyl-5-hepten-2-one, linalool, neral, geraniol, geranial, epoxide linaloolxide, 2-undecanone, tridecanone (Costa *et al*. 2005), mycene, (Z) -β-ocimene, (E) -β-ocimene (Oliveira *et al*. 2011), 6-methylhept-5-en-2-one, camphene, limonene, citronellal, N-decanal, Z-citral (neral), E-citral (geraniol), 2-undecanone, geranyl acetate, (E) -caryophyllene, 2-tridecanone, γ-cadinene, caryophyllene oxide (Pinto *et al*. 2015), cis-linalool oxide, α-terpinolene, citronellol, (E) -anetol, trans-α-bergamotene, (E) -β-ionone, cuparene, δ-cadinene, caryophyllene oxide, camphor juniper (Barbosa *et al*. 2008). α-citral, β-citral, β-myrcene, n-propyl acetate, isobutyl acetate, 2,7-dimethyloct-2,7-dienol, tetradecin, dimethylcyclopropanoic, verbenol, nerol, cyclooctanone, nerolic acid (Silva *et al*. 2014).	The essential oil extracted from the leaves presented microbicidal activity, microbicide on strains of *Staphylococcus* spp., *Streptococcus mutans* and *Candida* spp. (Almeida *et al*. 2013); anxiolytic and anticonvulsive effects in mice (Blanco *et al*. 2009; Costa *et al*. 2011); anti-inflammatory action in rats (in vivo); antifungal activity in *Candida albicans* strains (Silva *et al*. 2008), *C. tropicalis* and *Aspergillus niger* (in vitro) (Boukhatem *et al*. 2014), and antimalarial activity in mice (in vivo) (Tchoumbougnang *et al*. 2005). Polyphenols from *C. citratus* reduced the production of lipopolysaccharide-induced cytokines (LPS) in human and rat macrophages (in vitro) (Francisco *et al*. 2013). The fraction of tannins from the infusion of the leaves presented antioxidant activity (Costa *et al*. 2015), as well as the aqueous extract (in vivo, in rats) (Somparn *et al*. 2014). Aqueous extract prevented oxidative stress induced by H2O2 in male rats (Rahim *et al*. 2014). Leaf extract presented gastric protective activity on ethanol induced lesions in rats (Sagradas *et al*. 2015).	No toxicity data were found.
Verbenaceae *Aloysia citriodora* Palau	Composed of α-pinene, sabinene, 6-methyl-5-hepten-2-one, myrcene, limonene, (Z) -β-ocimene, γ-terpinene, cis-sabinene hydrate, linalool, trans-sabinene hydrate, trans-chrysanthemum, cis-chrysanthenol, terpinen-4-ol, trans-chrysantheenol, α-terpineol, nerol, neral, geraniol, geranial, δ-elemene, α-cubebene, α-copaene, geranyl acetate, β-cubebene, cis-α-bergamotene, α-cedene, β-caryophyllene, β-copaene β-gurjunene, α-caryophyllene, aromadendrene, β-acoradiene, geranyl propanoate methyl, germacrene D, α-curcumene, α-zingiberene, bicyclogermacrene, δ-cadinene, trans-cadine-1 (2) -4-diene, α-cadinene, (E) -nentolidol, germacrene-D-4-ol, espatulenol, caryophyllene oxide, epi- α-cadinol, α-cadinol (Argyropoulou *et al*. 2007), citronellal (Werdin *et al*. 2010), 1,8-cineole, cis-sabinene hydrate, cis-thione, neral, piperitone, geranyl, geranyl acetate, arcurcumene, epi-cubebol, spatulenol, caryophyllene oxide, tau-cadinol (Gil *et al*. 2007).	The aqueous extract of the leaves presented antispasmodic effect (tested in rat duodenum, in vitro) (Ragone *et al*. 2007); sedative and anxiolytic effects in rats and mice (in vivo and in vitro) (Ragone *et al*. 2010); antioxidant activity (Zamorano-Ponce *et al*. 2006; Portmann *et al*. 2012) and anti-inflammatory (in rats, in vitro and in vivo) (Ponce-Monter *et al*. 2010). The hexane extract from the leaves presented a spasmolytic and anti-inflammatory effect in fragments of the uterus of female rats (Ponce-Monter *et al*. 2010). The essential oil presented antioxidant and anesthetic activity in vivo in fish and shrimp larvae (Gressler *et al*. 2014; Parodi *et al*. 2014) and antibacterial against *Staphylococcus aureus* (Oliva *et al*. 2015), *Escherichia coli, Klebsiella ozaenae, Enterobacter aerogenes, Proteus mirabilis, Staphylococcus aureus* and *Enterococcus* sp. (Rojas *et al*. 2010).	No toxicity data were found.

therapeutic use: *Matricaria chamomilla, Melissa officinalis, Cymbopogon citratus* and *Passiflora edulis*. Scientific studies corroborate popular use as a sedative, but most studies are preclinical, with the few clinical studies (*M. chamomilla* and *M. officinalis*) being mainly exploratory and/or performed against placebo. Among the most cited species, *M. chamomilla* and *P. edulis* possess potential long-term toxicity. The present study finds *M. officinalis* to be the species with the best indications of clinical efficacy in the treatment of symptoms associated with anxiety, with an absence of toxicity data. Taken together, the results presented here evidence the need for further research on the plant species mentioned in ethnobotanical surveys carried out in the state of Rio Grande do Sul.

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