



The Therapeutic Potential of Phytomedicines from Brazilian Cerrado Herbs against Neurodegenerative Diseases

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Abstract

This short commentary is intended to briefly discuss the latest advances reported in literature about the use of native herbs from Brazilian Cerrado biome against neurodegenerative diseases. Henceforth, literature was surveyed concerning Cerrado's rich biodiversity and the implications of the highly variable constitution of secondary metabolites of the plants of this region. Nonetheless, Cerrado herbs showcase remarkable antioxidant activity, as stated in literature, which is also associated to anticholinesterase properties, what implicates that some plants of this biome might find use in the therapeutics of neurodegenerative diseases.

Keywords: Natural products, Neurodegenerative diseases, Alzheimer, Parkinson, Healthcare.

Introduction

Plant metabolism is acknowledged to be highly variable, what nonetheless confers complexity and wide range of therapeutic applicability. In this context, the myriad of metabolic outputs promoted by vegetal biochemical pathways allows the synthesis of diverse compounds which might be useful in healthcare. Amongst the most common metabolic outputs, phenylpropanoid and polyketide pathways are often associated to molecules of medicinal interest, whose biological activities might undergo synergism when herbal preparations are used [1,2]. Henceforth, the pharmacognostic assessment of plant material is highly regarded to shed light on their biological properties [3,4].

Ethnopharmacological reports evidence that medicinal plants are the first intervention of many folk medicine practices, what shows the importance of investigating these natural remedies in order to ensure therapeutic success and patient safety. Concerning the treatment of dementia, herbal medicines are widely used to alleviate symptoms and halt disease progression, being these applications manly supported by the antioxidant potential of

vegetal raw mater [5,6]. Notwithstanding, folk medicine practices have guided many phytopharmacological interventions towards the handling of neurodegenerative diseases, and these approaches are considered promising remedies to improve patient prognostic [7,8].

Regarding the use of medicinal plants against dementia, Brazilian Cerrado-flora presents itself as a valuable source of biologically active herbal mater. Given that Cerrado biome is known to harbor a plethora of vegetal varieties used in regional folk medicine, it is safe to say that the use of these plants by overall western medicine is still being unravelled [9,10]. Although previous reports contributed to shed more light on the applicability of Cerrado plants against neurodegenerative diseases, more investigations are needed in order to explore the pharmacological potential of this biome [11-13].

In view of the importance that Cerrado-flora presents as promising anti-dementia medicines, this short commentary is intended to evidence the latest advances reported in literature about

the use of native herbs of this biome against neurodegenerative diseases.

Cerrado-flora biochemical complexity against dementia

Plant secondary metabolism is regarded as one of the main sources of medicines, which might be used either through standardized pharmaceutical formulations or folk medicine preparations. Literature evidences several benefits from using plant-derived products in healthcare, due to the synergic effect promoted by phytomedicines [1-4]. Since plant metabolism allows the biosynthesis of widely diverse chemicals, this pool of compounds may interact with bodily receptors via potentiation, further enhancing the biological activity and henceforth, the appeal of natural products in pharmacology [14,15].

Considering that highly biodiverse biomes are stated to harbor vegetal varieties whose chemical arsenal might find use in healthcare, the investigation of native species is well regarded in the scope of drug-discovery. Nonetheless, biomes such as Brazilian Cerrado are targeted by local and foreign research groups in the exploration of therapeutically useful herbs. Cerrado is located in the central-western region of Brazil and consists of a highly variable landscape under intertropical climate. This biome shares many climatic and edaphological similarities with the African savannah and plays a distinct role in both Brazilian culture and economy [12,16]. Moreover, Cerrado relevance is also showcased in healthcare, since many herbs are used by local population in folk medicine remedies [16,17].

Amongst the diseases whose Cerrado plants might be used against are dementia. These sicknesses are neurodegenerative conditions which affect mostly the elder population and are marked by cognitive and motor impairment. Although dementia refers to a broad category of brain diseases, most share similar traits, such as the overall symptoms as well as pathogenesis, which might include oxidative damage, aberrant protein expression and cholinergic signaling impairment [17,18]. Most dementias are not curable according to contemporary medicine, and treatment consists of support therapy to alleviate symptoms. Although pharmacotherapy with cholinesterase inhibitors did enhance the quality of life of patients in some studies, the overall pharmacologic response is still highly variable [19,20].

Regarding Cerrado-flora potential against dementia, many reports showcased that several plants presented remarkable neuroprotective properties, what suggests that these plants might be useful to improve patient prognostic [10-13].

Antioxidant and anticholinesterase properties of Cerrado flora

Concerning the chemical richness showcased by Cerrado plants,

literature reports evidenced that these herbs present myriads of phenylpropanoid and polyketide metabolites whose therapeutic potential is yet to be used in medicine. Although almost all species of vegetal kingdom present ubiquitary compounds such as shikimic, gallic or ellagic acid, Cerrado plants showcase remarkable concentrations of either these compounds or their derivatives e.g. polyphenols [21,22]. Moreover, polyketide derivatives such as coumarines, furanocoumarines and anthraquinones are also readily available in underground parts of the plants i.e. roots [23,24].

Nonetheless, all these compounds do present some degree of biological activity, however, when neurodegenerative diseases are concerned, their radical scavenging potential is highlighted. As previous reports further evidenced, plant secondary metabolites of phenolic nature do exhibit thermodynamic proneness to not only stabilize reactive oxygen species [25-27], but also reconstitute endogenous antioxidants [10-13]. This characteristic has deep implications in the management of neurodegenerative diseases, since their progression is often associated to oxidative stress [24,28-31]. Notwithstanding, some of these metabolites also showcase proneness to inhibit acetylcholinesterase and butyryl cholinesterase, what further support their potential in the treatment of dementia [10,11,32].

Although the bulk of antioxidant and anticholinergic activity is attributed to the presence of phenolic derivatives, the biological activity of Cerrado plants is not only associated to thermodynamic feasibility of reactive oxygen species reduction and punctual enzyme interactions, but also to the chemical variety of phytoconstituents, which may allow them to bind to several distinct receptors in the human organism.

Literature reports that extracts from Cerrado plants promote vasorelaxation, as well as chemoinformatic studies indicate that secondary metabolites might interact with several receptors, henceforth leading to anti-inflammatory, anti-pyretic and anti-cancer activities [33-36]. Considering the complexity of the molecular basis of many neurodegenerative diseases, the potential of Cerrado plants to treat these as well as other disorders might be somewhat linked to such variety regarding biological activity, and the full scope of their therapeutic applicability is still being unravelled.

Conclusion

This short commentary was intended to briefly discuss the latest advances reported in literature about the use of native herbs of Cerrado biome against neurodegenerative diseases. In this sense, it was clear that Cerrado herbs showcase remarkable antioxidant activity, which is also associated to anticholinesterase properties, thence implicating that some plants of this biome might find use in the therapeutic of neurodegenerative diseases.

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Conflict of interest

Author declare that there is no conflict of interest.

References

- Thakur M, Bhattacharya S, Khosla PK, Puri S (2019) Improving production of plant secondary metabolites through biotic and abiotic elicitation. *Journal of Applied Research on Medicinal and Aromatic Plants* 12: 1-12.
- Jamwal K, Bhattacharya S, Puri S (2018) Plant growth regulator mediated consequences of secondary metabolites in medicinal plants. *Journal of Applied Research on Medicinal and Aromatic Plants* 9: 26-38.
- Palanichamy P, Krishnamoorthy G, Kannan S, Marudhamuthu M (2018) Bioactive potential of secondary metabolites derived from medicinal plant endophytes. *Egyptian Journal of Basic and Applied Sciences* 5(4): 303-312.
- Dhami N (2013) Trends in Pharmacognosy: A modern science of natural medicines. *Journal of Herbal Medicine* 3(4): 123-131.
- Xu J, Wei K, Zhang G, Lei L, Yang D, et al. (2018) Ethnopharmacology, phytochemistry, and pharmacology of Chinese *Salvia* species: A review. *Journal of Ethnopharmacology* 28(225): 18-30
- Heinrich M (2014) Ethnopharmacology: quo vadis? Challenges for the future, *Revista Brasileira de Farmacognosia* 24(2): 99-102.
- Costa GFC, Nishijo H, Caixeta LF, Aversi-Ferreira TA (2018) The Confrontation between Ethnopharmacology and Pharmacological Tests of Medicinal Plants Associated with Mental and Neurological Disorders. *Evidence Based Complementary and Alternative Medicine* 1-27.
- Moreno EKG, Thomaz DV, Machado FB, Leite KCS, Rodrigues ESB, et al. (2019) Antioxidant Study and Electroanalytical Investigation of Selected Herbal Samples Used in Folk Medicine. *International Journal of Electrochemical Science* 14: 838-847.
- Leite KCS, Garcia LF, Lobon GS, Thomaz DV, Moreno EKG, et al. (2018) Antioxidant activity evaluation of dried herbal extracts: an electroanalytical approach. *Revista Brasileira de Farmacognosia-Brazilian Journal of Pharmacognosy* 28(3): 325-332.
- Thomaz DV, Peixoto LF, Oliveira TS, Fajemiore JO, Neri HFS, et al. (2018) Antioxidant and Neuroprotective Properties of *Eugenia dysenterica* Leaves. *Oxidative Medicine and Cellular Longevity* 1-9.
- Oliveira TS, Thomaz DV, Neri HFS, Cerqueira LB, Garcia LF et al. (2018) Neuroprotective Effect of Camb. Leaves Is Associated with Anticholinesterase and Antioxidant Properties. *Oxidative Medicine and Cellular Longevity* 1-12.
- Schiassi MCEV, Souza VR, Lago AMT, Campos LG, Queiroz F, (2018) Fruits from the Brazilian Cerrado region: Physico-chemical characterization, bioactive compounds, antioxidant activities, and sensory evaluation, *Food Chemistry* 15(245): 305-311.
- Gasca CA, Castillo WO, Takahashi CS, Fagg CW, Magalhães PO, et al. (2017) Assessment of anti-cholinesterase activity and cytotoxicity of cagaita (*Eugenia dysenterica*) leaves. *Food Chem Toxicol* 109(2): 996-1002.
- Yang Y, Zhang Z, Li S, Ye X, Li X, et al. (2014) Synergy effects of herb extracts: Pharmacokinetics and pharmacodynamic basis. *Fitoterapia* 92: 133-147.
- Parra J, Quave CL (2017) Ethnophytotechnology: Harnessing the Power of Ethnobotany with Biotechnology. *Trends Biotechnol* 35(9): 802-806.
- Niranjan R (2018) Recent advances in the mechanisms of neuroinflammation and their roles in neurodegeneration. *Neurochem Int* 120: 13-20.
- Stefanes M, Roque FO, Lourival R, Melo I, Renaud PC, et al. (2018) Property size drives differences in forest code compliance in the Brazilian Cerrado. *Land Use Policy* 75: 43-49.
- Caixeta L (2011) Transcultural perspectives of dementia. *The Lancet Neurology* 10(4): 306-307.
- Lorito C, Pollock K, Harwood R, Nair R, Logan P, et al. (2019) A scoping review of behaviour change theories in adults without dementia to adapt and develop the 'PHYT in dementia', a model promoting physical activity in people with dementia. *Maturitas* 121: 101-113.
- Gale SA, Acar D, Daffner KR, (2018) Dementia. *Am J Med* 131(10): 1161-1169
- Giorgetti M, Negri G, Rodrigues E, (2011) Brazilian plants with possible action on the central nervous system:A study of historical sources from the 16th to 19th century. *J Ethnopharmacol* 109(2): 338-347.
- Tang CT, Belani LK, Das S, Jaafar MZ, (2013) Treatment of dementia with herbs: a short review. *La clinica terapeutica* 164(1): 43-46.
- Valli M, Pivatto M, Danuello A, Castro-Gamboia I, Silva DHS, et al. (2012) Tropical biodiversity: has it been a potential source of secondary metabolites useful for medicinal chemistry. *Química Nova* 35(11): 2278-2287.
- Cândido TLN, Silva MR, Agostini-Costa TS (2015) Bioactive compounds and antioxidant capacity of buriti (*Mauritia flexuosa* L.f.) from the Cerrado and Amazon biomes. *Food Chem* 15(177): 313-319.
- Thomaz DV, Leite KCS, Moreno EKG, Garcia LF, Alecrim MF, et al. (2018) Electrochemical Study of Commercial Black Tea Samples. *Int J Electrochem Sci* 13: 5433-5439.
- Thomaz DV, Couto RO, Roberth AO, Oliveira LAR, Leite KCS (2018) Assessment of Noni (*Morinda citrifolia* L.) Products Authenticity by Solid State Voltammetry. *Int J Electrochem Sci* 13: 8983-8994.
- Thomaz DV, Oliveira MG, Rodrigues ESB, Silva VB, Santos PA (2019) Physicochemical investigation of Psoralen binding to double stranded DNA through electroanalytical and cheminformatic approaches. In: 5th International Electronic Conference on Medicinal Chemistry Online.
- Kumar GP, Khanum F (2012) Neuroprotective potential of phytochemicals. *Pharmacogn Rev* 6(12): 81-90.
- Srivastav S, Fatima M, Mondal AC (2017) Important medicinal herbs in Parkinson's disease pharmacotherapy. *Biomedicine & Pharmacotherapy* 92: 856-863.
- Nishteswar K, Joshi H, Karra RD (2014) Role of indigenous herbs in the management of Alzheimer's disease. *Ancient science of life* 34(1): 3-7.
- Dos Santos-Neto LL, de Vilhena Toledo MA, Medeiros-Souza P, de Souza GA (2006) The use of herbal medicine in Alzheimer's disease-a systematic review. *Evid Based Complement Alternat Med* 3(4): 441-445.
- Budryn G, Grzelczyk J, Jaśkiewicz A, Żyżelewicz D, Pérez-Sánchez H, et al. (2018) Evaluation of butyrylcholinesterase inhibitory activity by chlorogenic acids and coffee extracts assed in ITC and docking simulation models. *Food Res Int* 109: 268-277.
- Oliveira LM, Oliveira TS, Costa RM, Martins JLR, Freitas CS, et al. (2018) Caryocar brasiliense induces vasorelaxation through endothelial Ca²⁺/calmodulin and PI3K/Akt/eNOS-dependent signaling pathways in rats. *Revista Brasileira de Farmacognosia-Brazilian Journal of Pharmacognosy* 28(6): 678-685.
- Tolouei SEL, Tirloni CAS, Palozi RAC, Schaedler MI, Guarnier LP, et al. (2019) *Celosia argentea* L. (Amaranthaceae) a vasodilator species from the Brazilian Cerrado: An ethnopharmacological report. *J Ethnopharmacol* 30(229): 115-126.

35. Jin X, Lee K, Kim NH, Kim HS, Yook JI, et al. (2018) Natural products used as a chemical library for protein-protein interaction targeted drug discovery. *Journal of Molecular Graphics and Modelling* 79: 46-58.
36. Khan RA (2018) Natural products chemistry: The emerging trends and prospective goals. *Saudi Pharmaceutical Journal* 26(5): 739-753.