Revista Brasileira de Farmacognosia
BRAZILIAN JOURNAL OF PHARMACOGNOSY
www.journais.elsevier.com/revista-brasileira-de-farmacognosia/

Original article

Does total tannin content explain the use value of spontaneous medicinal plants from the Brazilian semi-arid region?

*Julio M. Monteiro**, *João S.N. de Souza*, *Ernani M.F. Lins Neto*, *Keli Scopel*, *Elzineide F. Trindade*

Departamento de Biologia, Universidade Federal do Piauí, Campus Profa. Cinobelina Elvas, Planalto Horizonte, Bom Jesus, PI, Brazil

ARTICLE INFO

Article history:
Received 6 June 2013
Accepted 27 February 2014

Keywords:
Ethnobotany
Tannic compounds
Caatinga
Biodiversity conservation

ABSTRACT

Due to the current predatory exploitation and consequent extinction of native medicinal plants around the world, strategies have been proposed aiming at the sustainable use of these resources. Accordingly, this study aims at verifying the differences in tannin compounds content in the bark of eleven species with high use value (UV) and also relating the amounts of tannins with their therapeutic indications. To quantify the total phenolic content in the samples the Folin-Ciocalteu reagent was used, and for total tannins chemical casein precipitation was applied. The amount of tannins ranged intra-specifically and the greater variation was found for *Anadenanthera colubrina* (angico) that displayed between 157.57 and 107.39 mg/g. The lowest variation occurred in *Lafoensia replicata* (mangabeira) with values ranging between 76.55 and 68.96 mg/g. There were significant differences between several of the eleven species and according to the simple regression analysis, the quantities of tannins found failed to justify their UV. Thus, it was not possible to establish whether the amount of total tannins influenced to a greater or lesser degree in the accumulation of knowledge. Moreover, this is the first study to investigate the relationship between the amount of total tannins and local botanical knowledge expressed by the UV.

Introduction

Many studies have highlighted the great importance of plants with therapeutic use for traditional communities, whose daily practice lead to an impressive accumulation of knowledge (Almeida and Albuquerque, 2002; Morais et al., 2005; Monteiro et al., 2006a; Albuquerque et al., 2007; Mendes and Carlini, 2007; Araújo et al., 2008; Giraldi and Hanazaki, 2010; Monteiro et al., 2012). Hence, there is a need to expand the studies on medicinal plants to enable future strategies for knowledge and new compounds, or even drugs, acquisition. In Brazil, there are studies focusing on elucidating species or groups of medicinal plants with both pharmacological and phytochemical properties, studying classes of secondary metabolites with biological activities (Trugillho et al., 1997; Viana et al., 1997; Allain et al., 1998; Queiroz et al., 2002; Trevisan and Macedo, 2003; Paes et al., 2006; Souza et al., 2007; Leal et al., 2008; Silva et al., 2009; 2010a; Melo et al., 2011a,b; Almeida et al., 2012;

* *Corresponding author*.
E-mail: juliommonteiro@ufpi.edu.br (J.M. Monteiro).
0102-695X/$ - see front matter © 2014 Sociedade Brasileira de Farmacognosia. Published by Elsevier Editora Ltda. All rights reserved.
http://dx.doi.org/10.1016/j.bjp.2014.02.001

Siqueira et al., 2012) or through an ethnobotanical approach (Monteiro et al., 2006a; Albuquerque et al., 2007; Agra, et al. 2007; David et al., 2007; Mendes and Carlini, 2007; Giraldi and Hanazaki, 2010; Monteiro et al., 2011; Soldati and Albuquerque, 2012; Lucena et al., 2012; Zank and Hanazaki, 2012), accessing the knowledge and local use of these resources. For example, Monteiro et al. (2006a) found higher amount of total tannins in the stem bark than in leaves of *Anadenanthera colubrina* (Vell.) Brenan (angico) in Pernambuco, northeastern Brazil. However, the leaves of *M. urundeuva* Allemão (aroeira) had a higher concentration of tannins than the bark, contradicting the local knowledge that pointed the bark of this plant as the most efficient part for medicine manufacture.

Specifically in Piauí, Brazil; ethnobotanical, pharmacological or phytochemical studies on medicinal plants are still scarce and the vegetation is poorly sampled. Moreover, the flora richness of Piauí, characteristic of the transitional areas between the southern regions of Caatinga and Cerrado, provides a unique opportunity for research development covering the wide range of plant biodiversity associated with their traditional knowledge (Farias, 2003).

Given this panorama, one central question guided this study: does the content of tannin content in the bark of eleven species explain their use value? This study aims at evaluating the amount of tannins in eleven spontaneous tree species and relating them to their therapeutic indications (use value). This proposal was based on the premise that plants with astringent, healing and/or anti-inflammatory uses have tannins as the components responsible for such therapeutic activity (Mello and Santos, 2001; Monteiro et al., 2006a,b). Thus, it is expected that plants with higher use value carry a higher tannin content. Moreover, these phenolic compounds have the ability to form water-insoluble complexes with proteins; due to this property tannins have a number of biological activities, including astringency, anti-inflammatory and healing activities (Bruneton, 1991; Chung et al., 1998; Mello and Santos, 2001; Monteiro et al., 2005).

Materials and methods

The ethnobotanical research, selection, collection and study site of eleven spontaneous tree species

The collection area corresponds to a fragment of hypoxerophytic vegetation bordering the Santo Antonio Village, formerly called 'Boca da Caatinga', belonging to the municipality of Currais, located on the southern part of the state of Piauí in the Médio Gurguéia region. This area is limited to the north by the city of Palmeira, to the south with the municipality of Bom Jesus, to the east with Santa Luz and to the west with Baixa Grande do Ribeiro; and the approximate population is 4722 inhabitants (IBGE, 2008). The climate in this region is semiarid with a well-defined dry season during the summer and concentrated rains in the winter. The predominant features of the Caatinga vegetation consists of trees and of dense, low, gnarled and dry-looking shrubs during the summer, with small and outdated leaves, with deep and thick roots (Rodal and Sampaio, 2002). This vegetation component does not form a homogeneous structural and floristic set, but varies depending on factors such as soil, xerothermal index, physiognomy and characteristic plant families: Myrtaceae and Fabaceae (Lemos and Rodal, 2002).

The ethnobotanical research started with informal visits to the Santo Antonio Village establishing a relationship of trust with the locals and the recognition of the study area. For a small community (34 families) all those responsible for residences were invited to participate, totaling 32 interviews, two residents declined participation. After a brief explanation of the objectives of the study all participants were invited to sign a consent form. The access to local knowledge was through semi-structured interviews (Albuquerque et al., 2010), divided into two steps: collecting socioeconomic data of respondents and their knowledge about medicinal plants, the main question was about medicinal plants with anti-inflammatory and healing indications and the part of the plant used.

Ten individuals were selected of the eleven trees and spontaneous species with anti-inflammatory and healing described activities by fitting the following criteria: high use value, portrayed here by their local relevance (good knowledge and use by the aforementioned community) and whose products are obtained by strongly destructive actions (stem bark).

The Use Value (UV) calculated for the eleven species was based on the proposal of Rossato et al. (1999), which is the ratio between citated number of uses of the species mentioned per each interviewee and the total number of interviewees. After calculation, the eleven native species with higher UV were: amburana (*Amburana cearensis* (Allemao) A.C. Sm., Fabaceae); mangabeira (*Lafoensia replicata* Pohl, Lythraceae), aroeira (*Myracrodruon urundeuva* Allemão, Anacardiaceae), pau-d'óleo (*Copaifera langsdorffii* Desf., Fabaceae), catinga-de-porco (*Terminalia brasiliensis* (Cambess. ex A. St.-Hil.) Eichler, Combretaceae), jatobá (*Hymenaea stigonocarpa* var. *pubescens* Benth., Fabaceae), pau-de-rato (*Caesalpinia bracteosa* Tul., Fabaceae), angico (*Anadenanthera falcata* (Benth.) Speg., Fabaceae), inharé (*Brosimum gaudichaudii* Trecul, Moraceae), ameixa (*Ximenia americana* L., Ximeniaceae) and folha-de-carne (Casearia *sylvestris* var. *angustifolia* Uittien, Salicaceae).

A data collection guided tour (Albuquerque et al., 2010) to obtain the stem bark of plants, consisted of walking with informants in a scrub fragment next to the local community to identify and collect the samples from ten individuals of each species. All samples were deposited to the Herbarium Graziela Barroso (TEPB) at the Universidade Federal do Piauí.

This paper was submitted to the Ethics Committee in Research of the Universidade Federal do Piauí and accepted under the Registration Number: 0191.0.045.000-11.

Determination of total tannins in the stem bark of eleven medicinal species selected

Stem bark of ten individuals of each species were collected, stored in paper bags and taken to the Laboratory of Organic Chemistry, UFPI, Campus Prof. Cinobelina Elvas in Bom Jesus, PI for analysis of total tannins. The Folin-Ciocalteu assay and the chemical casein precipitation were used to quantify the total phenolic content in the samples by using tannic acid as standard for total tannins (Folin and Ciocalteu, 1927; Hagerman and Butler, 1989; Mueller-Harvey, 2001; Schofield et al., 2001; Verza et al., 2007; Bueno et al., 2012; Blainski et al., 2013).