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Ethnopharmacological study and topical anti-inflammatory activity of crude extract from *Poikilacanthus glandulosus* (Nees) Ariza leaves

Thiele Faccim de Brum [a,*], Camila Camponogara [b], Roberta da Silva Jesus [a], Bianca Vargas Belke [a], Mariana Piana [a], Aline Augusti Boligon [a], Fernanda Brum Pires [a], Sara Marchesan Oliveira [b], Marcelo Barcellos da Rosa [a], Liliane de Freitas Bauermann [a]

[a] Graduate Program in Pharmaceutical Sciences, Federal University of Santa Maria, Camobi Campus, Santa Maria, RS 97105-900, Brazil
[b] Graduate Program in Biological Sciences, Toxicological Biochemistry, Federal University of Santa Maria, Camobi Campus, Santa Maria, RS 97105-900, Brazil

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ABSTRACT

Ethnopharmacological relevance: Ethnopharmacological studies are important tools as records and documentation of the empirical uses of medicinal plants in traditional communities with the purpose of generating useful knowledge to lead to the development of new medicines, biodiversity conservation and enhancement of knowledge and local culture. *Poikilacanthus glandulosus* is widely used by the population of City of Santiago, in Brazil, nevertheless, it does not have any validation regarding its use and its medicinal effects.

Aim: The objective of this study was to perform one ethnopharmacological survey about *P. glandulosus* in the City of Santiago and determine the anti-inflammatory activity in order to prove its uses in popular medicine.

Methods: Personal and ethnopharmacological data were collected through a prepared questionnaire. The phytochemical analysis was performed observing the individual methodology for each reaction and by HPLC-UV. The antiedematogenic and anti-inflammatory (cell infiltration and histological procedure) activities of the *P. glandulosus* (0.01–1000 μg/ear) were evaluated in the ear edema model induced by topical application of croton oil.

Results: *P. glandulosus* is known in City of Santiago as "Gaiana" and its macerated leaves and branches are prepared with alcohol or sugarcane liquor especially for insect bites, cicatrization and inflammation. HPLC analysis revealed the presence of maslinic acid (2.024 ± 0.10 mg/g), uvaol (0.124 ± 0.02 mg/g) and sitosterol (0.502 ± 0.05 mg/g). The topical application of crude extract of *P. glandulosus* reduced in a dose-dependent manner the croton oil-induced ear edema and myeloperoxidase activity (neutrophils infiltration marker) with maximum inhibition of 87 ± 2% and 64 ± 12%, respectively at 1000 μg/ear. Dexamethasone (100 μg/ear), used as a positive control, inhibited croton oil-induced ear edema in 89 ± 3% and decreased myeloperoxidase activity in 50 ± 3%. Both *P. glandulosus* as dexamethasone reduced cell infiltration when evaluated by histological procedure

Conclusion: This work allowed us to understand the specie *P. glandulosus* through ethnopharmacological study and it showed that the crude extract presented antiedematogenic and anti-inflammatory actions, proving their traditional use as anti-inflammatory.

1. Introduction

Plants are important sources of therapeutic drugs and play a significant role in the survival of the tribal and ethnic communities (Rajakumar and Shivanna, 2009). Indigenous knowledge of plant species is the result of human interaction and selection of the most desirable, powerful and successful plant species found in the instantaneous environment at a specific time period (Venkataswamy et al., 2010; Lulekal et al., 2013).

According Cotton (1996), the tribal healers usually administer decoction, pills, or paste of medicinal plants or plant parts as full or partial treatment of ailments. In fact, it has further been explained that the discovery of modern medicine was possible on the basis of the use of plants by traditional knowledge. Adequate documentation of healing practices by traditional healers of ethnic groups is a necessity, for such knowledge can become an important source for the discovery of newer drugs (Rahmatullah, et al., 2010).

* Corresponding author.
E-mail address: thichaim@gmail.com (T.F. de Brum).

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In this regard, ethnopharmaceutical research involves the study of the identification and the classification of the natural material from which the remedies are produced, their preparation and the effects on humans and animals. Are search focused on ethnobotany of rural communities isolated from the main developed city centers allows to discover traces of traditional knowledge regarding the use of local plants as medicine (Menale and Muoio, 2014).

The knowledge of medicinal plants often represents the only therapeutic option for many communities and ethnic groups. The traditional medicine in poor countries is the most accessible practice and, in certain situations, the only treatment available (Revene et al., 2008).

The discovery and disclosure of medicinal flora properties, through the knowledge of traditional populations, is, therefore, an important tool in preserving the cultural richness of different regions (Oliveira et al., 2011).

The plants offer immense scope for researchers engaged in validation of traditional claims for the development of novel drugs (Schmidt et al., 2009). Since interest in traditional medicine has been increasing world over, ethnobotanical studies have gained prominence to explore the traditional knowledge particularly in developing countries (Joshi and Joshi, 2000).

In Brazil, the use of herbs for medicinal purposes is a widespread practice, enhanced by cultural differences, deriving from colonisation by the European and African populations, in addition to traditional indigenous knowledge (Gomes et al., 2008).

Among the plants of interest in Brazilian medicinal flora, it can be cited *Poikilacanthus glandulosus,* which belongs to the Acanthaceae family and is widely used in traditional medicine for various diseases and symptomatology in the region of the City of Santiago in the State of Rio Grande do Sul, Brazil. However, this plant does not have any validation regarding its use, and especially for its medicinal effects and toxicity. The growing interest and need of research on medicinal plants, especially those species not yet studied, and the requirement to develop new agents in the treatment of several diseases, led to this work so that there is a greater understanding around this species, particularly to prove its medicinal effects about inflammatory skin processes.

2. Material and methods

2.1. Ethnopharmacologycal study

The field data have been collected from April to November 2015, with forty volunteers in the City of Santiago, who have used *P. glandulosus* for medicinal purposes. The choice of venue is due to the use of the species being studied for medicinal purposes by the population and the fact that it is found in the woods and backyards of the homes of some residents.

We interviewed forty informants of both sexes, at least 20 years old, chosen for a previous survey. Personal and ethnopharmacological data were collected during structured interviews and informal conversations as described by Etkin (1993) and Alexiades (1996), in order to get the highest number of information about the popular use of P. glandulosus. The interview was conducted through a prepared questionnaire divided into two parts (Table 1), the first of which contains information about the personal data of the interviewees (age, sex, level of education). The second part refers to ethnopharmacological data of the species under study (collection site, period of collection, cultivation, source of knowledge, way of preparation, parts used, popular name, form of use, therapeutic indication, results obtained, reason for use, conservation, solvent maceration, side effects and single plant or associated), to the main illnesses and/or symptoms. The identification of this plant was confirmed by comparison to the specimen stored in the herbarium of the Federal University of Santa Maria (RS, Brazil).

Table 1
Description of variables of the questionnaire.

Personal data	**Answer options**
Age	( ) 0–20, ( ) 21–30, ( ) 31–40 ( ) 41–50, ( ) 51–60 ( ) > 60
Sex	( ) female, ( ) male
Instruction degree	( ) literate, ( ) illiterate, ( ) complete primary education, ( ) incomplete primary education, ( ) finished high school, ( ) incomplete high school, ( ) higher education, ( ) postgraduate
Ethnopharmacological data	**Answer options**
Collection site	( ) in the backyard, ( ) thicket, ( ) unknown
Period of collection	( ) summer, ( ) autumn, ( ) winter, ( ) spring, ( ) indifferent
Cultivate	( ) yes, ( ) no
Source of knowledge	( ) family, ( ) health professionals, ( ) known
Way of preparation	( ) fresh, ( ) after drying ( ) infusion, ( ) maceration
Used parts	( ) leaf, ( ) branches, ( ) root, ( ) flowers, ( ) all parts, ( ) leaf and branch, ( ) leaf, branch and root, ( ) leaf and flower
Popular name	( ) gaiana, ( ) other
Form of use	( ) external use, ( ) orally, other ( )
Results obtained	( ) satisfactory, regular, ( ) no effect
Reason for use	( ) cheaper, ( ) It does not harm health, ( ) good result
Conservation	( ) dried plant, ( ) fresh plant, ( ) macerated
Solvent maceration	( ) alcohol, ( ) cachaça, ( ) alcohol/cachaça
Side effects	( ) yes, ( ) no
Single plant or associated	( ) yes, ( ) no

2.2. Plant collection

The leaves of *P. glandulosus* were collected in the City of Santiago, State of Rio Grande do Sul, Brazil, in May of 2013, (coordinates 29°11′31″S and 54°52′1″W). A voucher specimen is preserved in the herbarium of the Department of Biology at Federal University of Santa Maria by register numbers SMBD 12.442 and 13.178.

2.3. Plant extraction

Plant material was dried at room temperature and powdered in a knife mill. The leaves (1.217 kg) were macerated at room temperature with 70% ethanol for a week with daily shaking; the solvent was renewed several times. After filtration, the hydroalcoholic extract (HE) was evaporated under reduced pressure at a temperature below 40 °C, in order to obtain the aqueous extract (AE); part of this AE was evaporated to dryness on a rotary evaporator furnish a crude extract (CE).

2.4. Qualitative analysis of compounds

The phytochemical analysis was performed according to specialized literature (Moreira, 1979; Matos, 2009), observing the individual methodology for each reaction and verifying the possible presence of the chemical groups of secondary metabolism in the plant drug.

2.5. Quantitative analysis of non-polar compounds by HPLC

For identification and quantification of the non-polar compounds was using the method of Schimidt (2016), which uses reverse phase chromatography with ultraviolet detection (UV–vis). The chromatographic system Dionex used has pump P680 model,