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ETHNO-PHARMACOLOGICAL STUDIES OF BRAZILIAN CAATINGA PLANTS: A REVIEW

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ABSTRACT

This study aimed to review the results of scientific papers on the main ethno-pharmacological studies carried out with species from the Brazilian Caatinga Region. We searched the electronic databases: SciELO, PubMed, LILACS and CAPES. The period of time was defined as 10 years, having as key words: hypoglycemic, vegetable (extract), phytotherapic and biotechnological potential. The Caatinga is one of the main Brazilian biomes. It represents considerable plant diversity and has numerous species used by the population for many purposes. It is the most critical biome, threatened and altered by human activities. The use of medicinal plants plays an important role in the treatment and prevention of diseases around the world and means a source of innovation and discovery of new drugs. The traditional use of these plants in the treatment of diseases is related to the technological and pharmaceutical development of new therapeutic inputs. However, the lack of information about this biome makes difficult the use of this Brazilian biotechnological potential. This work aims to relate the main ethno - pharmacological studies carried out with Caatinga species from 2008 to 2018, in order to assist in the prospection and greater use of the area 's biodiversity and in the elaboration of other studies.

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INTRODUCTION

Brazil has the highest genetic diversity in plant species in the world, but less than 10% were evaluated for their biological characteristics and less than 5% were submitted to detailed biochemical studies. The biodiversity of the Brazilian fauna is little explored in terms of knowledge the chemical constitution, the therapeutic potential of its plants, and consequently its biotechnological applications (Bezerra *et al.,* 2011). The use of medicinal plants plays an important role in the treatment and prevention of human diseases worldwide and represents a source of innovation and discovery of new drugs. The traditional use of these plants in the treatment of diseases is related to the technological and pharmaceutical development of new therapeutic inputs (MEGRAJ *et al*, 2011). Ethnobotanical studies include information on the use of plants of local vegetation, highlighting the purpose and forms of use. These studies serve as the basis for many scientific research that end up testing and confirming these practices carried out by the local population. In addition to providing subsidies for new pharmacological discoveries and to be more effective and cheap than random findings. Therefore, this type of study has grown so much in recent years (RITTER *et al.,* 2015). However, the lack of reliable information on plant drugs and their extracts makes it difficult to use this Brazilian biotechnological potential (BOORHEM, 2009). This work aims to relate the main ethno-pharmacological studies carried out with Caatinga species from 2005 to 2018, in order to assist in the exploration and greater use of the area's biodiversity and in the elaboration of other studies.

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Table 1. Ethno-Pharmacological Studies performed with Caatinga plants from 2008 to 2018

Reference	PLANT	EXPERIMENTAL MODEL	MAIN RESULTS
Mata et al; 2009	*Cereus jamacaru*	Incidence and control of pathogens	Use of essential oils reduces the incidence of pathogens in the studied plant
Costa, E;2010	*Astroniumurundeuva*	Evaluationofantimicrobial activity	All the analyzed substances presented antimicrobial activity
Cunha e Silva *et al*; 2010	*Crotonlinearifolius*	Bioavailabilityofethanolicextract	Presence of alkaloids, steroids, flavonoids, tannins and reducing sugars.
Lobo, KMS; 2010	*Solanumpaniculatum* *Operculinahamiltonii*	Evaluation of antibacterial activity and phytochemical prospecting	Only Solanumpaniculatum showed good results
Bezerra, DAC; 2011	*Mimosa tenuiflora*	Phytochemical and bromatologicalprospecting	Extract shows antimicrobial activity
Santos, VL; 2011	*Maytenusrigida*	Evaluationofantimicrobial activity	Theyshowedantimicrobial activity
Weber, CR; 2011	*Anadenanthera colubrina:*	Study of the therapeutic potential	AntimicrobialPotential
Medeiros, EV; 2012	*Senna alata*	Evaluationofantimicrobial activity	Ethanolic extracts were effective in the in vitro control of *Fusariumoxysporum*
Dias Silva, MJ; 2012	*Mimosa tenuiflora*	Antioxidant and antimicrobial activity	Both evaluationswere positive
Silva, VF; 2014	*Encholiriumspectabile*, *Bromelialaciniosa*, *Neoglazioviavariegata*, *Amburana cearensis, Hymenaeamartiana*e *Selaginella convoluta*	Evaluationofantimicrobial activity	The alcoholic dilution of all the extracts presented inhibitory activity beforeallbacterialgeneros
Rangel Carvalho Simões; 2015	*Bauhiniaforficata*	Phytochemical prospection and antimicrobial activity	Presenceofhypoglycemicmetabolites
Pozzobon; 2014	*Bauhiniaforficata*	Evaluation of glycemia in diabetic patients	There was no hypoglycemic effect
Salvi; 2016	*Bauhiniaforficata*	Evaluation of glycemia in diabetic patients	There was no hypoglycemic effect
Marques; 2012	*Bauhiniaforficata*	Phytochemicalprospecting	Flavonoids, proanthocyanidins, leucoanthocyanidins, triterpenes, steroids, sugars flavonoids
Peixoto Sobrinho; 2012	*Bauhiniaforficata*	Spectrophotometric investigation in commercialized samples	The results do not show uniformity in the concentration of totalflavonoids,
Souza, 2013	Amburana cearensis	Medical and cosmetic use	Cosmetic and medicinal potential
Arend et al. 2015	*Cecropia glaziovii Snethl*	Hypoglycemic effect study	Proven hypoglycemic activity
Santos, 2015	*HyptisLeucocephala*	Evaluation of antimicrobial activity	Antimicrobial Potential
Ventura et al., 2014	Geranium ayavacense	Hypoglycemic effect study	Proven hypoglycemic activity
Paredes *et al*. (2016)	*C.quercifolius/phyllacanthus*	Evaluation of antimicrobial activity	Provenhypoglycemic activity
Lira *et al*. (2017)	*C.quercifolius/phyllacanthus*	Hypoglycemic effect study	Provenhypoglycemic activity
Machado *et al*. (2018)	*Psidiumguajava L. (guava) and Psidiumbrownianum*	Estudo do efeito citotóxico e antimicrobiano	Provenhypoglycemic activity

MATERIAL AND METHODS

A systematic review using the PUBMED, LILACS and MEDLINE databases and the SciELO electronic library was conducted in order to identify scientific papers published between 2008 and 2018. In order to locate articles not identified in such research, the Virtual Health Library (VHL), which integrates the aforementioned databases, is also available. The search for the above sources was carried out with the following keywords: "vegetal extract", "and" caatinga plants "and" plants of the caatinga ". The analysis of the selected material took as reference the categorization of the studies according to the type of study and objectives, plant used, experimental model and main results found.

RESULTS

Combining all the search methods, 26 articles were identified, fulfilling the inclusion criteria. Table 1 describes these studies in relation to the following aspects: first author, year of publication, plant, experimental model and the main results. In all, 36 different plants were mentioned. The studies cited were related to antimicrobial, antifungal, anti-inflammatory, antioxidant, genotoxic, hypoglycemic effects and use of plants for cosmetic purposes. The study of the antimicrobial activity explored in the plants is encouraged due to the great molecular diversity found in the vegetal extracts when compared to synthetic drugs. In addition to the significant increase of microorganisms resistant to conventional antimicrobial drugs (BEZERRA *et al.,* 2011). These drugs, in addition to being costly, can cause bacterial resistance in both the human and animal organs. When such drugs are used in slaughter animals for human consumption, there is a serious risk of subjecting a high-residue food to the population that consumes it. The use of plant extracts is a cheaper and more effective option for the treatment of bacterial infections (SILVA *et al*, 2014). On this activity the following species stand out: C. quercifolius / phyllacanthus; Hyptisleucocephala, Bauhinia forficata, Encholiriumspectabile, Bromelialaciniosa, Neoglazioviavariegata, Amburanacearensis, Hymenaeamartiana and Selaginellaconvoluta, Mimosa tenuiflora and Astroniumurundeuva. The type of extract most used in research involving bacterial activity was the ethanolic extract, used in all researches of this nature. These extracts were effective in controlling microorganisms related to infectious processes such as: Staphylococcus aureaus, Pseudomonas aeruginosa, Escherichia coli, Shigellaflexineri, Klebsiellapneumoniae, Salmonella sp. Some cited plants presented more than one study relating their extracts with their antimicrobial abilities. The species known as jurema-preta (Mimosa tenuiflora), jurema-branca (Piptadeniastipulacea) and the species: Maytenusrigida, Cereus jamacaru and Bauhinia forficata are prominent. Regarding the parts of the plants used in the studies, most of them used the leaves (15) and the stem (10), although the roots (06), seeds (01) and flowers (03) were also mentioned in studies. Plant barks and roots stand out because they are independent of climatic conditions, being available in all seasons of the year, the same does not occur with leaves and flowers (SALVI, 2016). However, Santos (2012) points out that the technique of collecting biological

material can often be erroneously performed and contribute to the predatory extraction of the area in question. The bark of trees should be removed in small pieces and only on one side of the trunk in order to preserve the species. In the review the following metabolites were mentioned: flavonoids, tannins, steroids, coumarins, alkaloids, glycosides, ligans, saponins, leucoantocyanidins, catechins, triterpenes and several categories of essential oils. Flavonoids are natural pigments whose main function is to protect plants against the action of oxidizing agents. They are considered one of the largest groups of secondary metabolites of plants and are present mainly in leaves and fruits. The research cited in the review associates the functions of flavonoids, mainly to work on hypoglycaemic action and, consequently, benefits in the circulatory system. Tannins, however, act as radical scavengers that intercept active oxygen and form stable radicals; avoiding free radicals. This process is essential in the prevention and treatment of diseases such as cancer, multiple sclerosis and atherosclerosis (SILVA, 2015).

The elaboration of vegetal extracts of the constituents of the plants is the first stage for the characterization of the chemical constituents present in the vegetal material. These extracts can be obtained through ethyl alcohol, methanol or solvents such as hexane, ethyl ether, ethyl acetate, among others (MATOS, 2009). In the review, the preparation of ethanolic extracts (07), aqueous extracts (07), methanolic extracts (05) and hexane extracts (01) were demonstrated. The work carried out by Frasson *et al*. Evaluated the activity of the parasite Trichomonasvaginalis, responsible for acute infections, pelvic inflammatory diseases, increased risk of infertility, cervical cancer and facilitation of HIV infection in 44 aqueous extracts from 23 plants in the Caatinga region. In relation to the anti-inflammatory capacity of some species, the adverse effects of the use of drugs in the fight against infections stimulate the investigators to study the pharmacological activity of crude extracts and their bioactive compounds isolated on acute and / or chronic inflammatory diseases. The association between antibiotics and plant extracts represents a new possibility of treatment against various diseases (Marmitt, 2015).

In the researches found the anti-inflammatory capacity stands out among the species: Ximeniaamericana, Anandenantheracolubrina, Miracrodruonpyramidalis, Amburanacearenses, Solanumpaniculatum, Operculinahamiltonii, Chenhopodiumambrosioides, Caesalpinia ferrous and Acacia mimosoceae. Besides the physiological and metabolic aspects that some plants present in the human organism; the nutritional aspects are reported by folk medicine in the elaboration of infusions and syrups popularly consumed for various purposes. Examples of such use are the following species: Piptadeniastiupulacea, Bauhinia cheilantha, Tabebuiaimpetiginosa, Jathopharibifola, Croton moritibensis, Aspidospermapyrifolium, Phylanthusniruri and Cnidoscolusurens. These plants are reported by communities as part of the treatment of diseases such as diabetes and hypertension.

When we analyze the use of plants by the community and the knowledge about them, some species stand out for their versatility of use, being used for more than one purpose: fodder, technology, medicinal, fuel, food and / or ornamentation. The main species cited with these characteristics were: Myracrodruonurundeuva, Schinopsisbrasiliensis, Croton blanchetianus Baill, Mimosa tenuiflora, JuremaPreta and Piptadeniastipulacea (Benth.) The importance of the Caatinga species goes beyond the idea of using natural resources only for the production of drugs; since other implications can be considered as the use of biofuels or bioenergetics produced from plants. Some species have high calorific value and are commonly used as firewood, such as: Anadenantheracolubrina var. cebil, Caesalpiniapyramidal is and Schinopsisbrasiliensis (LEITE, 2012). Environmental awareness is the main management tool used to improve the quality of life of communities and intensify the reciprocal relationship between man and nature. Local communities play a key role in providing information on management and how they exploit natural resources for their livelihoods. This popular knowledge is the starting point for scientific research on available resources (SILVA, 2014 b). The loss of endemic species, the elimination of natural ecological processes and the extensive desertification nuclei in the Caatinga region are a reflection of the low conservation coverage of this area. Only 2% of the territory is protected by areas of environmental conservation (MELO-BATISTA, 2014). The sustainable commercial exploitation of the Caatinga plant diversity requires bioprospecting, research, production, processing and commercialization of products such as pharmaceuticals, food, herbal products, fiber, among others. This whole process seems to be still incipient in Brazil. Currently, the level of investment in research that sustainably exploits this biome is very small in relation to the biological diversity existing in the country. The challenge is to reconcile popular knowledge, the traditional knowledge of the communities, the valorization of cultural identity and the sustainable exploitation of the Caatinga's wealth through policies of valorization of plant diversity.

Conclusions

The use of bioactive compounds of plants involves a series of interdisciplinary knowledge among the areas of traditional chemistry, phytochemistry, pharmacology, medicine, nutrition and other areas of health knowledge. Integrating these areas may lead to greater effectiveness in discovering new drugs. However, few papers presented in the review demonstrated the interdisciplinarity between them. In addition, researchers in general must know the main purposes of the plants used by the population so that they can guide and educate the communities to enjoy their benefits better without harming the environment. Including guidance on the interaction between species and the level of toxicity of each species. Despite the number of investigations involving research into antimicrobial effects, hypoglycemic and antioxidant effects, there is still a great deal of vacuum in the pharmacological exploration regarding antitumor effects, estrogenic activities, protein characterization, healing effects, analgesics, moisturizers and other investigations which were not verified in the review.

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