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Research Article

Exploring the Therapeutic Potential of *Amburana cearensis*: A Scientometric Study on an Endangered Medicinal Tree

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Amburana cearensis (Fabaceae) is a native tree of the Brazilian northeastern semiarid region, which has considerable economic, medicinal, and social importance, especially in the Caatinga biome. This study aims to identify the scientific knowledge generated about the pharmacological applicability of the species. We analyzed scientific works on the widespread pharmacological use of *A. cearensis*, adopting the scientometric research method. The medicinal properties were classified according to the uses mentioned in the manuscripts, considering body systems and treated symptoms. They were associated with the International Classification of Diseases and Related Health. We identified a total of 86 articles addressing the medicinal potential of the species, distributed in 57 journals published between 2005 and 2023. There was a significant increase in publications during the period evaluated. Also, the species has been widely used in traditional medicine, which has attracted new studies, especially experimental ones focusing on unraveling its pharmacological potential. One trend observed was a significant geographic bias, since most of the studies investigated were carried out by researchers linked to Brazilian institutions located mainly in the northeast. This region includes the largest number of species occurrence points, explaining the interest of these institutions in recognizing the biological potential of their local or regional flora. In-depth investigations into the medicinal properties and secondary metabolites produced by *A. cearensis* should continue so that its therapeutic benefits are fully understood. However, it is necessary to link research into chemical and pharmacological properties with consideration of the importance of sustainable management of the species, since it faces risks of extinction. We acknowledge that an earlier version of this manuscript was presented as a dissertation by Ayane Emília Dantas dos Santos to fulfil the academic requirements for the degree of Forest Science at the Federal University of Rio Grande do Norte. The dissertation is available for reference at the following link: https://repositorio.ufrn.br/jspui/bitstream/123456789/46918/1/Cienciometriaetnobotanicamodelagem_Santos_2022.pdf.

1. Introduction

The indiscriminate human exploitation of natural wealth has generated serious consequences in terrestrial dynamics. The magnitude of human actions is observed mainly in renewable natural resources, with direct or indirect influence on the increase of extinction rates [1] and the number of endangered species. This is the case of *Amburana cearensis* (Allemão) A.C.Sm, popularly known as *cumaru* or *imburana-de-cheiro*, which has significant economic and medical potential, but is threatened with extinction according to the IUCN Red List of Threatened Species [2] due to the predatory extraction of its wood [3]. This species occurs in various regions of Brazil, such as in the dry savanna woodlands, Cerrado, Caatinga, and Chaco in the Brazilian Northeast, Southeast, and Midwest, as well as in plateau areas ranging from elevations of 500 to 1000 meters associated with rich or poor soils restricted to places with calcareous outcrops. Besides Brazil, it also occurs in dry forest enclaves, deciduous and occasionally semideciduous forests, that extend to Paraguay, Argentina, and Bolivia [4].

Its disappearance could cause irreparable harm to the ecosystem, triggering negative environmental and social impacts. In addition, population reduction makes it virtually impossible to conduct research that fully identifies its chemical composition and pharmacological applications [3]. Thus, it is necessary to document the pharmacological richness of the species and then formulate strategies for its conservation to contribute to the ecological balance of the biome.

A. cearensis presents various uses in ethnomedicine among with its pharmacological properties. According to [5], the antibacterial and in vitro antimalarial effect of the stem bark chloroform and dichloromethane extracts, as well as the variety of isolated compounds with antifalciparum, leishmanicidal, and bactericidal activities are some of the pharmacological properties of *A. cearensis*. In addition, according to the same authors, the stem bark and seeds of the species have therapeutic properties commonly used in teas, decoctions, and syrups to treat respiratory, rheumatic, and spasmodic diseases.

Phytochemical studies have identified some important chemical compounds such as flavonoid derivatives, isokaempferide, and kaempferol, as well as an isoflavone, afrormosin, which presents pharmacological activities such as anticancer, anti-inflammatory, antioxidant, and vasorelaxant effects [6]. Reference [5] affirms that the main isolated chemical components found in this species are coumarins, flavonoids, glycosylated phenols, phenolic acids, phenylpropanoid derivatives, and triterpenoids.

An effective way to establish such strategies is to recognize the socio-environmental potential of the species. To this end, surveys have been conducted to ascertain the use of plants by local populations and evaluate scientific knowledge about specific themes [7]. Scientometrics has helped with these surveys through the analysis of the quantitative and qualitative aspects of the relevant scientific production [8]. Through this tool, it is possible to present an overview of trends in the scientific literature regarding the therapeutic properties of the species *Amburana cearensis*.

Therefore, we aimed to identify the main trends in scientific production about the species. The following hypotheses guided our study: (i) there is growing interest from researchers in studying and better understanding the medicinal components present in the species; and (ii) the number of studies involving experimental investigation methods is growing, with the objective of investigating the pharmacological potential suggested by the use in traditional medicine.

2. Materials and Methods

Initially, we analyzed scientific works on the widespread pharmacological use of *Amburana cearensis*. Therefore, we adopted the research method known as scientometrics (Figure 1), which has proved beneficial in conducting surveys and analyses of the quantitative and qualitative aspects of scientific output [8]. We followed the methods of Santos [9].

The searches to identify scientific production were performed in the databases "Web of Science" (https://webofscience.com), "Scielo" (https://scielo.br) "Scopus" (https://scopus.com), "PubMed" (https://pubmed.ncbi.nlm.nih.gov), and "Google Scholar" (https://scholar.google.com). The scientific name, synonyms, and popular name of the species were used as keywords to search for articles. As inclusion criteria, we considered only scientific publications with the accepted botanical name of the species, *Amburana cearensis*, its synonyms *Torresea cearensis* and *Amburana claudii*; and the vernacular name *cumaru*. Thus, excluded from the analyses were undergraduate course completion papers, dissertations, theses, ebooks, and research originating from event proceedings and investigations related to the species, but did not encompass studies focusing on its medicinal properties.

For each study presenting the popular species name, we verified if the approach was related to the species *A. cearensis*. Keywords had to appear in the title, abstract, or keywords. In addition, we considered only scientific research involving the ethnobotanical aspects of the species or its potential for drug production between 2005 and 2023.

For each study related to *A. cearensis*, we determined, based on the above criteria, the following information: (a) journal name; (b) classification of the study according to the methodology used; (c) impact factor; (d) the number of citations; (e) scope of the journal; (f) language in which the article was published; (g) the number of authors involved in each publication; (h) name of the first author and the respective institutional affiliation; (i) academic background of the principal author; (j) corresponding author; (k) region where the study was carried out; (l) biome, considering the location of sample collection reported; and (m) therapeutic purpose of using extracts of the species. This information was organized in Microsoft Excel spreadsheets and quantified using the R software.

We obtained the Impact Factor (IF) of the journals considering the CiteScore, an indicator that denotes the impact of publications based on their respective number of citations. We also used the percentile, an index that makes it easier to know the exact percentage where each journal is positioned within its specialty. The Scopus platform, the global analytics company Elsevier's most prominent scientific database, has developed these metrics. The purpose of the metrics is to define the impact and relevance of peer-reviewed works (books, journals, and other scientific publications) based on citations, including supplements and special issues of these journals [10].

We considered only publications in Web of Science to analyze the number of citations and impact factor of journals. We used the Shannon-Wiener diversity index (H') to estimate the diversity of journals that published works related to ethnobotany and the pharmacological applications of the species [11]. We investigated the scope of each journal to identify how international its circulation is. For this, we consulted the data on each journal on the website of the Brazilian Institute of Information in Science and Technology (IBICT), specifically in the section Consultation of the National Collective Catalog (CCN) (https://ccn.ibict.br/busca.jsf). The medicinal properties reported in each study analyzed were classified according to the medicinal

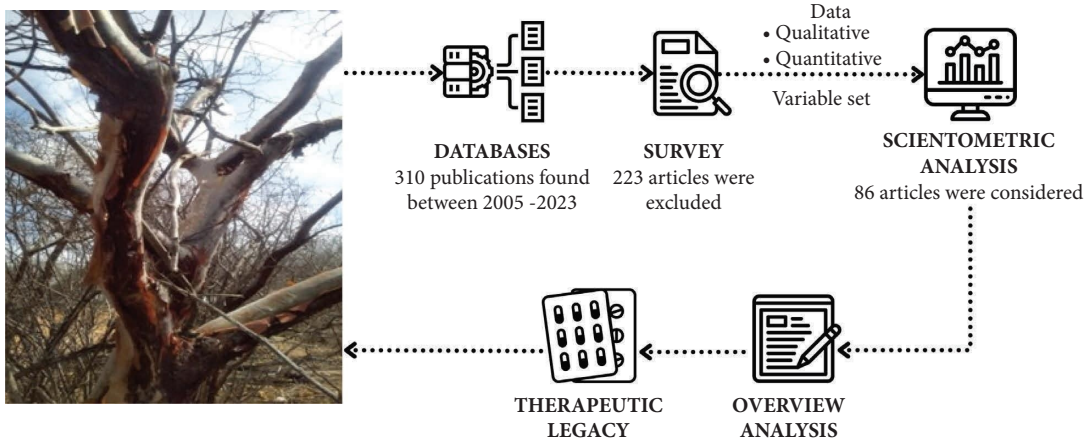


Figure 1: The flowchart summarizes the scientometric method utilized in this research.

uses mentioned in the manuscripts, considering body systems and treated symptoms. Subsequently, they were associated with the International Classification of Diseases and Related Health Problems–ICD 10 [12].

3. Results

A total of 310 publications referring to the species *A. cearensis* were found and indexed in the databases consulted between 2005 and 2023. After filtering the data, 223 articles were excluded for not meeting the established criteria. Thus, 86 articles were considered in the scientometric analysis, distributed in 46 journals (Table 1). The Shannon-Wiener diversity index obtained from these quantitative values was $H' = 3.98$. Therefore, the diversity of journals that published studies related to *A. cearensis* is relatively high.

A more significant number of experimental studies (56.98) were observed, focusing on unraveling the chemical composition and therapeutic purposes of *A. cearensis*. Broken down further, there were ethnobotanical investigations (26.74%) concentrated on the preservation and understanding of traditional uses, and clinical analysis studies (2.33%) aiming at evaluating the effects of medications derived from the species on the organism. These clinical studies are randomized analyses, which prove to be effective in confirming the medicinal potential of phytotherapeutic products, as well as in evaluating the safety of therapeutic approaches. Studies prioritizing the association of one or more methods, such as ethnobotanical/experimental, experimental/software, were also recorded, as well as literature review/patent analysis (Figure 2).

Each of the articles that conducted this investigation was consulted regarding citation numbers, considering that this analysis is one of the goals established for the journal to achieve a higher impact factor. Thus, the number of citations ranged from 0 to 97, with the article by Albuquerque and Oliveira [13] published in the "Journal of Ethnopharmacology" having the highest number of citations (117), followed by the article by Bitu et al. [14] published in the "Journal of Ethnopharmacology," and the article by Canuto and Silveira [15] published in the journal "Química Nova" (Figure 3).

The journals analyzed were considered, in general, as references of quality and capacity for project research in a global context. Thus, a trend observed in this study was that among the articles in the sample, those with the highest number of citations were published in journals with the highest impact factor.

We also observed that several journals from non-English speaking countries, including Brazilians, have prioritized publishing in English. Therefore, English was the most used language of articles (62.63%), followed by Portuguese (34.9%), Spanish, and Japanese (both 1.6%). In addition to another article that was published in Portuguese and English versions, corresponding to a percentage of 1.6%.

The academic affiliation of the first author of each article was investigated to obtain a list of educational intuitions involved in research on the species. An almost total predominance of Brazilian institutions was observed. Only the study by Kim [16] came from a foreign institution, Gyeongnam, located in South Korea. The Brazilian intuitions that presented the highest number of publications were from the northeast region of the country: the Federal University of Ceará (with 15 studies), the Federal University of Vale do São Francisco (with eight investigations) and the Federal University of Pernambuco (with six). The representation levels of the other teaching and research institutions can be observed in Figure 4, and the specific listing with the definitions of the abbreviations of each center used for the study sampling is in Table 2.

The Caatinga biome stands out as the most representative (75.58%), followed by the Cerrado (9.30%) and the Atlantic Forest (1.6), respectively. It is noteworthy that 12.79% of the articles investigated did not inform the location in which the samples were taken (collection of *Amburana cearesis*; products from the species) or were developed using specific methodologies that did not include collection of the species.

The medicinal properties of the species were classified according to the medicinal indications mentioned in the

Table 1: List of scientific journals that included the analyzed studies and their respective scope.

Periodical	NP	A	CS	P
Brazilian journal of pharmacognosy	6	N	2.9	65%
Brazilian journal of medicinal plants	5	N	N/A	N/A
Journal of ethnopharmacology	4	I	6.3	81%
Journal of the Brazilian chemical society	3	N	2.5	54%
Scientia plena	3	N	N/C	N/C
Fitos magazine	3	N	N/C	N/C
Basic and clinical pharmacology and toxicology	2	I	4.3	60%
Molecules	2	I	4.1	61%
Evidence-based complementary and alternative medicine	2	I	2.9	74%
Rural science	2	N	1.2	56%
Caatinga magazine	2	N	1.0	50%
Química nova	2	N	1.1	34%
Drug and chemical toxicology	2	I	5.2	80%
Neuroscience letters	1	I	4.1	45%
Life sciences	1	I	5.3	88%
Medical plant	1	I	4.7	88%
Proceedings of the Brazilian academy of sciences	1	N	3.7	77%
Academic geographic magazine	1	N	N/A	N/A
Acta physiologiae plantarum	1	I	3.7	77%
Phytomedicine	1	I	7.3	95%
Brazilian journal of veterinary science	1	N	N/A	N/A
Brazilian journal of pharmaceutical sciences	1	N	1.0	39%
BioMed research international	1	I	3.6	64%
Brazilian journal of research in health sciences	1	N	N.C	N/C
Theriogenology	1	I	4.2	96%
Orbital: The electronic journal of chemistry	1	N	N.C	N/C
Summa phytopathologica	1	N	0.5	15%
Open access library journal	1	I	N/C	N/C
Journal of medicinal plants research	1	I	N/A	N/A
Natural product communications	1	I	1.0	3.5%
Phytochemistry letters	1	I	2.5	68%
International journal of complementary and alternative medicine	1	I	N/C	N/C
Unisanta health science	1	N	N/C	N/C
Blacpma	1	N	N/C	N/C
Science of the total environment	1	I	8.6	92%
Search	1	N	N/C	N/C
Seminar: Agricultural sciences	1	N	1.1	5.2
Food and chemical toxicology	1	I	6.7	91%
International journal of recent research and review	1	I	N/A	N/A
Biocatalysis and agricultural biotechnology	1	I	N/A	N/A
Journal of applied biological chemistry—scimago journal	1	I	N/A	N/A
Journal of multidisciplinary engineering science technology	1	I	N/C	N/C
3 biotech	1	I	3.2	76%
African journal of biotechnology	1	I	N/A	N/A
Acta scientiarum. Biological sciences	1	I	0.6	31%
Recent patents on biotechnology	1	I	3.9	47%
Brazilian journal of natural sciences	1	N	N/C	N/C
Ethnobotany research and applications	1	I	2.8	93%
Irinian journal of basic medicinal sciences	1	I	N/C	N/C
Oxidative medicine and cellular longevity	1	I	10.1	87%
Research, society, and development	1	N	N/C	N/C
Biodiversity magazine	1	N	N/C	N/C
Ethnoscientia	1	N	N/C	N/C
Multidisciplinary journal of northeastern minas gerais	1	N	N/C	N/C
Revista nursing	1	N	N/C	N/C
Diversitas journal	1	N	N/C	N/C

NP = number of publications per journal; A = scope; N = national; I = international; CS = citescore; P = percentile; N/A = not applicable; N/C = not included.

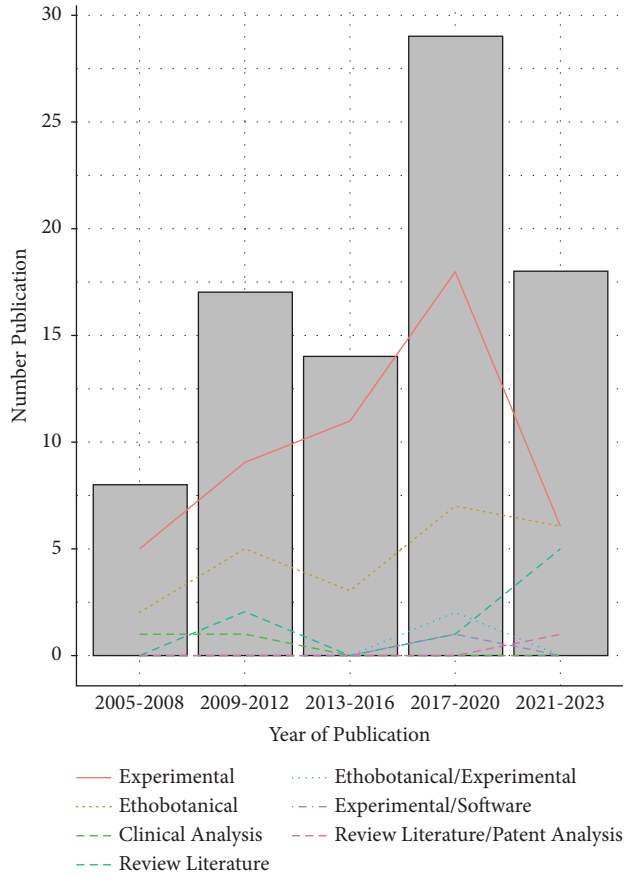


Figure 2: Number of articles published from 2005 to 2023 in intervals of four years and classification of the study according to the method of analysis.

articles. Next, these were classified according to the International Classification of Diseases—ICD 10 (Table 3).

In addition to the indications presented in the table, some of the studies revealed the ability of the species to have anti-inflammatory, analgesic, antidiuretic, antioxidant, anticoagulant, anti-allergic, acaricidal, and/or edematogenic activity. The effectiveness of *Amburana cearensis* in controlling some parasites and aiding specific treatments of animal fertility was also mentioned in some of the articles.

It is important to emphasize that many of the therapeutic indications presented in Table 2 originate from studies conducted with traditional communities. These investigations consider the use that humans make of natural resources as a tactic for their survival and the accumulation of information generated from their customs and practices, as we can observe in Table 4.

4. Discussion

We found growth in the number of publications and study methodologies, reflecting the progressive interest of researchers over the years regarding *Amburana cearensis*, especially concerning therapeutic efficacy (experimental studies) and the preservation of ethnobotanical knowledge. The pharmaceutical industry is facing major challenges in developing new pharmacological products [37]. As a result, investigations of natural resources intensified, searching for discoveries to underpin the development of new therapeutic products. The predominance of publications describing experimental investigation can be explained by the benefits of the current technological development, which facilitates the determination of the plant's pharmacology and mechanisms of action [38]. Additionally, there were a growing number of ethnobotany studies during the period studied, reflecting the desire to preserve traditional knowledge of the use of medicinal species, which is usually the starting point for experimental investigations. In this light, the results of the scientometric study in the present work reflect a growing convergence between modern medicine and traditional medicine.

The number of citations represents the social and cognitive resources of science. The citing and referencing techniques are practices that favor the logical expression of producing, organizing, disseminating, preserving, and using information based on the scientific method [39]. According to the evaluation of the citations, the older articles (2005–2016) generally had a larger number of citations compared to the more recent ones (2017–2023). Thus, the time elapsed after publication is an essential factor in the number of citations. According to Souza et al. [8], articles are usually cited in the first two years after publication. However, when citations occur mainly in these early years,

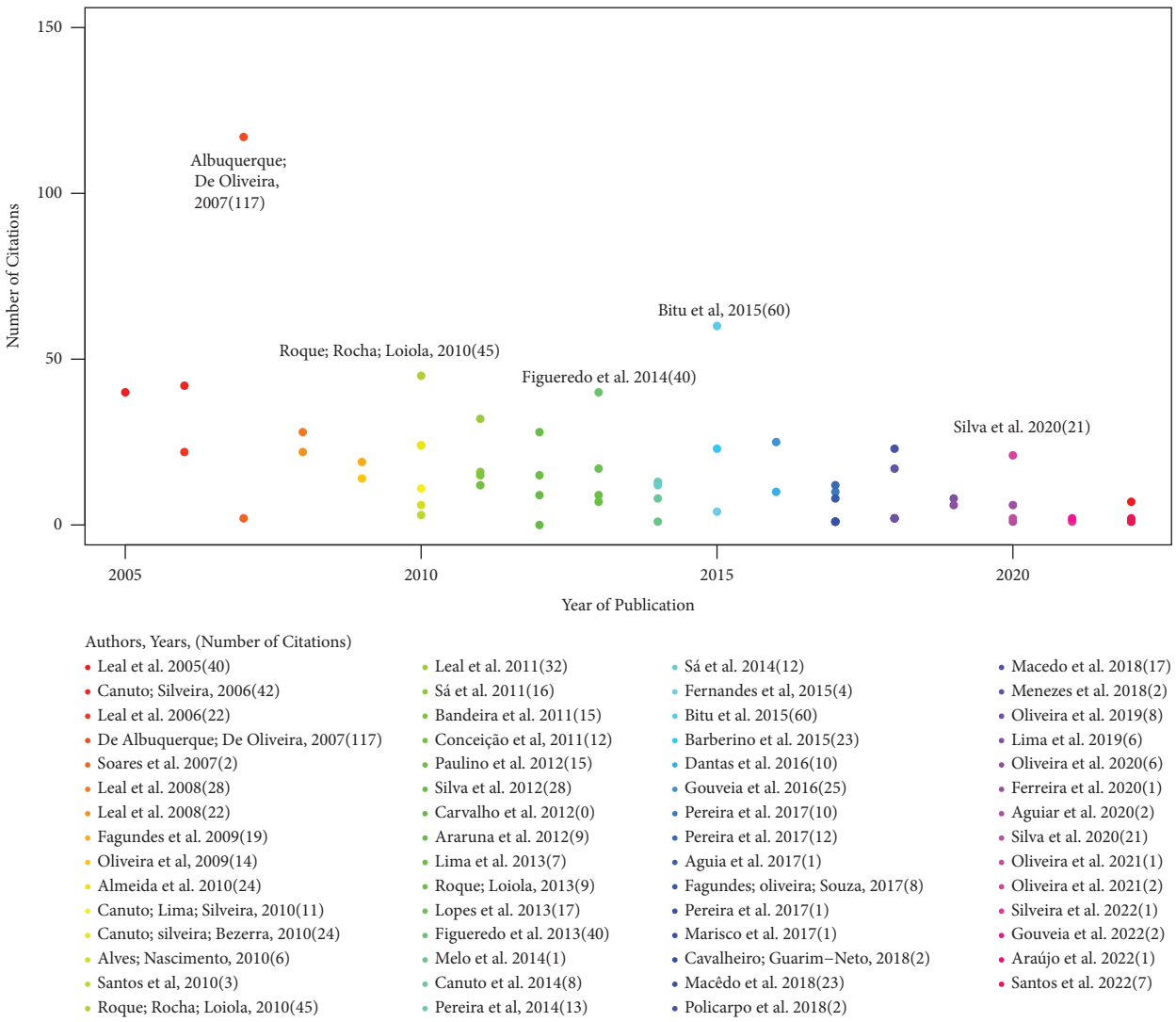


Figure 3: Number of citations versus year of publication and authorship of scientific articles.

researchers can benefit more quickly from the expanding number of citations of their works [40]. Therefore, citation analysis is essential to determining the bibliometric impact of scientific production.

International journals have more significant impacts than national ones (Table 1). Due to this disparity, editors involved in national scientific publications have sought strategies to intensify their reputation and promote their journals' internationalization to improve indicators that measure the impacts of their publications. As a result, several journals from non-English-speaking countries, including Brazilian ones, have prioritized publication in English to increase the presence in the main international databases, thus raising visibility for wider access. Therefore, the English language is recognized as the leader in communicating and disseminating scientific ideas [8].

The significant concentration of public universities in the elaboration of the studies investigated, particularly in the Brazilian northeastern states, can be explained by the incentive to train researchers and the creation of new graduate programs supported by CAPES in the region, especially in recent years [41]. Regarding the contribution of institutions, there is predominance of universities (UFC, UNIVASF, and UFPE). Since *A. cearensis* is a native species of the northeastern semiarid region where these universities are located, this reflects the desire of their administrators and researchers to recognize the biological potential of their local or regional flora. This reality is also reflected in the representative participation of studies of the Caatinga biome in our sample.

There also was considerable presence of articles involving the Cerrado biome. It is considered a hotspot for conservation due to its impressive biodiversity [42].

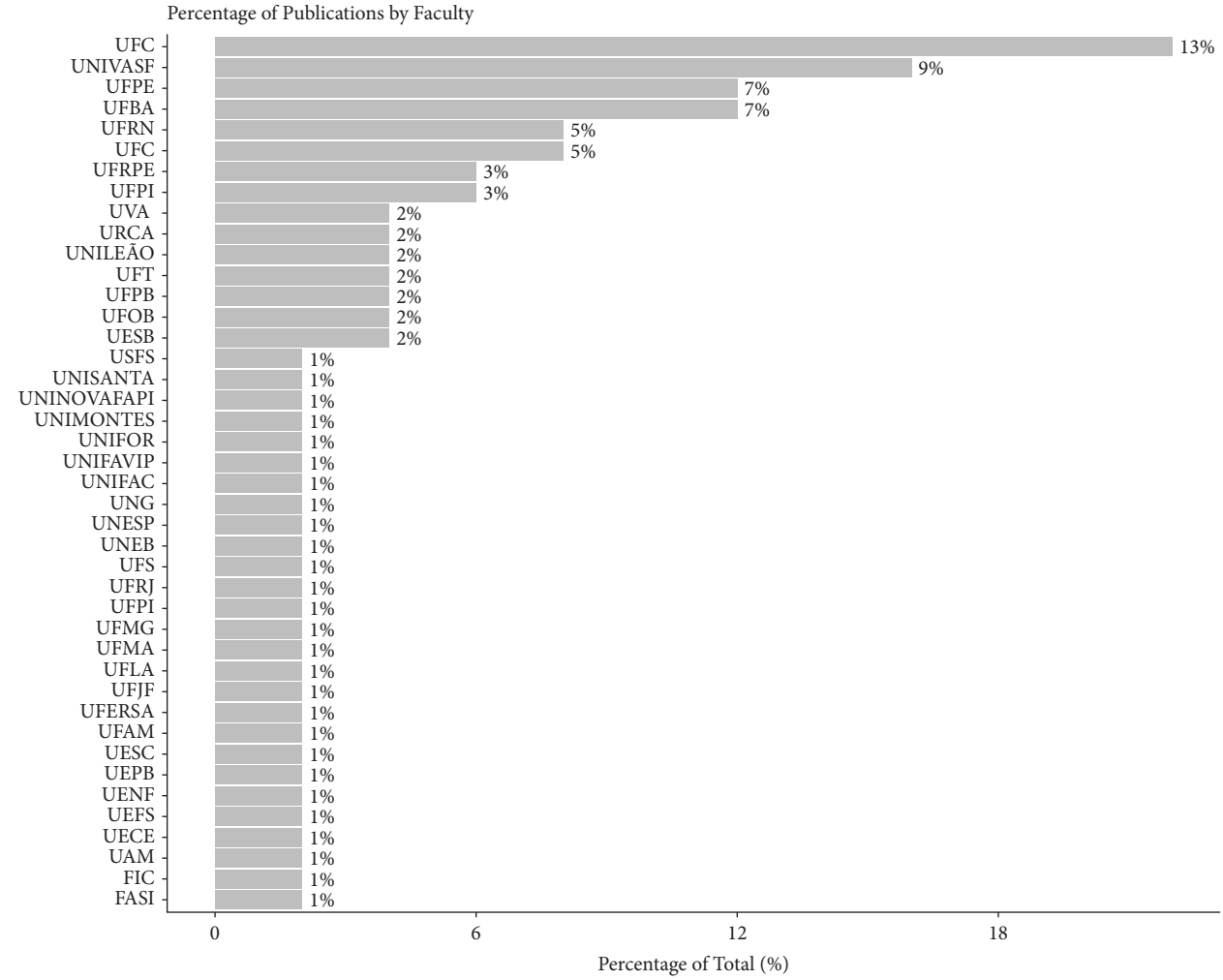


Figure 4: Distribution of the percentages of publications in relation to educational institution.

Another factor that explains its representativeness is the fact that *A. cearensis* is native to the Caatinga but not endemic. Therefore, the species is part of the phytogeographic domains of other biomes such as Cerrado, Atlantic Forest, and Pantanal [43].

A. cearensis is widely used in traditional medicine for therapeutic purposes (Tables 3 and 4). In addition to the potential reported by residents of the traditional communities that make use of this plant, detailed experimental studies have confirmed other possible medicinal uses of the species, as can be seen in the investigations carried out by Almeida et al. [3]; Leal et al. [44]; Santos et al. [45]; Dantas et al. [46]; Aguiar et al. [47]; and Pereira et al. [48]. Among these potentials, the cytotoxic effect on cancer cells and protective action against hepatotoxicity stand out, revealing the ability of *A. cearensis*, through its principle ingredients, to perform functions in different body systems [49].

It is also important to highlight the toxicity effects of the species to determine its safe consumption, and for that, studies carried out by Almeida et al. [3] concluded that high doses of the hydroalcoholic extract present in the coumarin, extracted from *A. cearensis*, did not show any teratogenic effect on Wistar rats, as well as daily doses of 20 mL (each) of "*cumaru*" syrup for 30 consecutive days, which did not show any changes in the volunteer patients' clinical-laboratory parameters.

Phytochemical investigations were able to identify the distinguished chemical composition found in in different parts of *A. cearensis*. For instance, analysis of its stem bark extracts resulted in the isolation of coumarin and amburosides A and B; coumarins, gallic and ellagic acid, catechin, rutin, and morin were found in its seeds, as well as phenolic compounds such as protocatechuic acid, epicatechin, gallic acid, and kaempferol in its leaf ethanolic extract [50]. The medicinal properties found in those

Table 2: List with the definitions of abbreviations of the teaching and research institutions that were part of the study sample.

Abbreviation	Educational and research institutions
UFC	Federal University of Ceará
UNIVASF	Federal University of the São Francisco Valley
UFRN	Federal University of Rio Grande do Norte
UFBA	Federal University of Bahia
URCA	Cariri Regional University
UNILEAO	Leão Sampaio University center
UFT	Federal University of Tocantins
UFRPE	Rural Federal University of Pernambuco
UFPE	Federal University of Pernambuco
UFPB	Federal University of Paraíba
UFOB	Federal University of Western Bahia
UESB	State University of Southwest Bahia
UVA	Vale do Acaraú State University
USF	University São Francisco
UNISANTA	University Santa Cecília
UNINOVAFAPI	Uninovafapi University Center
UNIMONTES	State University of Montes CLAROS
UNIFOR	University of Fortaleza
UNIFAVIP	University Center of the Ipojuca Valley
UNIFAC	University of Salvador
UNG	Gyeongsang National University
UNESP	Paulista State University
UNEB	State University of Bahia
UFS	Federal University of Sergipe
UFRJ	Federal University of Rio de Janeiro
UFPI	Federal University of Piaui
UFMG	Federal University of Minas Gerais
UFMA	Federal University of Maranhão
UFLA	Federal University of Lavras
UFJF	Federal University of Juiz de For a
UFERSA	Federal Rural University of the Semi-Arid
UESC	Santa Cruz State University
UEPB	State University of Paraíba
UENF	North Fluminense State University Darcy Ribeiro
UEFS	State University of Feira de Santana
UECE	State University of Ceará
FIC	Carajás Integrated College
FASI	Faculty of Health Ibituruna

compounds are scientifically supported by in vivo and in vitro studies that utilized bark extracts and fractions, with only nine compounds being evaluated for their pharmacological effects, reporting the various uses of *A. cearensis* as anti-inflammatory, antinociceptive, antimicrobial, and, as discovered in recent assays, as acaricidal, repellent, and photoprotective [50]. Therefore, the therapeutic efficacy of the species has not only been confirmed for the treatment of diseases and other ailments but also to support assisted reproduction of sheep, since its extract can be used to maintain the survival and growth of preantral follicles, as confirmed by the studies by Gouveia et al. [51] and Menezes et al. [52]. Moreover, this plant is also promising for veterinary medicine. Finally, there is a need to consider the development of public policies and programs to conserve biodiversity, including *A. cearensis*. These initiatives may involve creating priority areas for conservation containing large populations of the species, facilitating natural regeneration with local seed stocks, developing a circle of cooperation among stakeholders, and enacting legislation to conserve the genetic diversity of the species [53].

Table 3: Therapeutic purposes of the species recorded by the analyzed studies, and their receptive performance in physiological systems, organized according to the International Classification of Diseases—ICD 10.

ICD 10 category and code	T.P.S.	N° of studies
Chapter I (A00–B99) Infectious and parasitic diseases	Diarrhea	01
	Antibacterial activity	04
	Antimicrobial activity	06
	Antifungal activity	01
	Leishmaniasis	01
	Measles	01
	Smallpox	01
Chapter V (F00–F99) mental and behavioral disorders	Eating disorder-Anorexia	01
	Depression	01
Chapter VI (G00–G99) nervous system diseases	Migraine and headaches	02
	Neurodegenerative diseases	07
Chapter X (J00–J99) respiratory system diseases	Influenza	08
	Sinusitis	03
	Asthma	06
	Bronchitis	06
	Pneumonia	
Chapter XI (K00–K93) Digestive system diseases	Tooth eruption	01
	Functional disorders of the intestine	06
	Ulcers	02
	Stomachache	03
	Gastroesophageal reflux	01
	Digestive diseases	01
	Intestinal colic	02
Chapter XII (L00–L99) skin and subcutaneous tissue diseases	Skin inflammation	01
Chapter XIII (M00–M99) Osteomuscular and connective tissue diseases	Rheumatism	04
	Healing	01
	Muscle aches	01
		01
Chapter XIV (N00–N99) diseases of the genitourinary system	Urinary tract infection	01
	Kidney disorders	01
	Menstruation suspension	01
Chapter XVIII (R00–R99) abnormal symptoms, signs and laboratory and clinical examination findings, not classified elsewhere	Sore throat,	02
	Clipping	05
	Fever	01
	Dizziness	01
Chapter XIX: (S00–T98) Injury, poisoning and some other consequences of external causes	Toxic effect of contact with venomous animals such as snakes	04
	Injuries	01

T.P.S: therapeutic purpose of the species.

Table 4: Indications for medical uses of *Amburana cearensis* reported by traditional communities.

Indications for medical uses	PU	MP	Geographical region	Reference
Used in the treatment of influenza, coughs, anorexia, external ulcers, urinary tract infections and sinusitis	ba, fl, and se	N.E.	Cariri paraibano—NE Brazil	[17]
Influenza, sinusitis, headache, muscle pain, cough, constipation and dizziness	ba, se	Syrup, maceration, powder, tablets	Rural community of laginhas, caicó, RN—NE Brazil	[18]
Cough, bronchitis, asthma, lung disorders, rheumatic pain, sinusitis and suspension of menstruation	ba	N.E.	Terezina, PI -NE Brazil	[19]
Poor digestion, diarrhea, intestinal colic, healing and snake bite	ba, fl, se, and sh	Decoction, infusion, maceration	Town of Laços, Tanhaçú, Ba—NE Brazil	[20]
Fatigue, bronchitis, sinusitis and other respiratory diseases	ba	Homemade syrup	Apodi, RN—NE Brazil	[21]
Flu, sinusitis, headache, muscle aches, cough, and constipation	ba, se	Homemade syrup, maceration, candies	Rural Community of Laginhas, Caicó—NE Brazil	[22]
Control of abdominal pain, bronchitis, asthma, rheumatism, menopause and hypertension	ba, se	Decoction, infusion, maceration, poultice	Monte Azul, MG—SE Brazil	[23]
Cough, influenza, sore throat and wound	ba, fl	Seasoning, decoction (tea), infusion	Crato, Juazeiro and Babalha, CE—NE Brazil	[14]
Intestinal gas, sinusitis, constipation, calming, colic, anti-anemic, antiflu, bronchitis, body pain, headache, snake venom, stomach pain	se, ba	Tea e tincture	Vista Alegre District, Claro dos Poções, MG—SE Brazil	[24]
Digestive system diseases	se, ba	Infusion	Rural Community of São Sebastião, Vitória da Conquista, BA—NE Brazil	[25]
Treatment of gastric ulcers	N.E	Homemade syrup	Cubatão, SP—SE Brazil	Guimarães et al. 2017
Inflammation and analgesic	N.E	Prepared in alcohol	Aldeia Velha Community, Chapada dos Guimarães, MT—CO Brazil	[26]
Inflammation of the skin, throat, gynecological, influenza, measles, fever and influx	ba	N.E.	Serra do Zabelê (Nova Olinda, CE), Matozinho, Estância, Serra do Zé Gomes and Mangueiras (Exu- PE)—NE Brazil	[27]
Influenza, expectorant, sinusitis and wound	ba	Decoction, sauce, inhalation, bath	Quincunca Community, Farias Brito, CE—NE Brazil	[28]
Diseases of the respiratory system, digestive system, cardiovascular system, diseases of the blood and hematopoietic organs, infectious and parasitic diseases, snake bites and migraines	st, rb, sa, sh, se	Tea, syrup, bath, gargle, tincture, inhalation	Conservation Unit Tatu Bola, Lagoa Grande, Pernambuco—NO Brazil	[29]
Anti-inflammatory, intestinal colic, flu, stomachache, snake bite, diarrhea, migraine, emetic, headache, joint pain, dizziness, fever, constipation, depurative, diuretic, kidney infection	se, ba	N.E.	Community of Santo Antonio, Currais, PI—NE Brazil	[30]
Expectorant and sinusitis	ba	Homemade syrup	Barra de Santa Rosa, Cuité, Nova floresta Baraúna, Picuí, PB, Jaçanã, RN—NE Brazil	[31]
Chickenpox, infantile colic, inflammation in general, tooth, eruptions, influenza, antipyretic and expectorant	ba, se	Syrup and bath	Oeiras, PI—NE Brazil	[32]
Nervous system disorders, used especially as a calming and as antidepressant	ba, se	Tea, tonic and homemade syrup chewed	Texeira de Freitas, BA—NE Brazil	[33]
Infection	ba, se	N.E.	Humaitá, AM—N Brazil	[34]
Influenza	ba	Bath	Terezina, PI—NE Brazil	[35]
Intestinal diseases	se	Tea	Bom Jesus, PI—NE Brazil	[36]

PU = part used; MP= method of preparation; ba = bark; sb = stem bark; rb = root bark; sa = sap; fl = flower; se = seed; sh = sheet; st = stem; N.E. = not specified; PI = Piauí; BA = Bahia; RN = Rio Grande do Note: SE = Sergipe; MG = Minas Gerais; SP = São Paulo; NE= Nordeste; MT = Mato Grosso; CE = Ceará; PE = Pernambuco; AM = Amazonia; NE = Nordeste; SE = Sudeste; CO = Centro Oeste; N = Norte.

5. Conclusions

Amburana cearensis is widely used in traditional medicine, attracting the interest of researchers to perform studies, especially experimental ones, focusing on unraveling its pharmacological potential. Through the data collected, we found a large geographic bias, since most of the studies were performed by researchers linked to Brazilian institutions, especially in the northeast region, which contains the largest number of points of occurrence of the species. In-depth investigations into the medicinal properties of the primary and secondary metabolites produced by *A. cearensis* should continue so that its therapeutic benefits are fully understood. Finally, it is necessary to recognize the importance of linking chemical and pharmacological analyses with investigation of the sustainable management of the species, since it is facing extinction. Furthermore, to improve conservation management, social, political, and economic trade-offs are decisive to reach practical solutions.

Data Availability

The datasets produced and/or examined during the present investigation can be obtained from the corresponding author upon a reasonable request.

Additional Points

Highlights. (i) We examined the *Amburana cearensis* pharmacological uses and categorized them based on body systems and treated symptoms. (ii) The species' widespread use in traditional medicine has attracted new studies, particularly experimental research, to uncover its pharmacological properties. (iii) *A. cearensis* holds promise for application in veterinary medicine.

Conflicts of Interest

The authors declare there are no conflicts of interest.

Authors' Contributions

AEDS, FAV, and CGF conceived and designed the research. AEDS conducted the data collection. AEDS and FAV performed the research. AEDS, FAV, CGF, and VRBS analyzed the data. AEDS and FAV wrote the manuscript. All authors read, reviewed, and approved the final manuscript.

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