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TRADITIONAL ECOLOGICAL KNOWLEDGE, BIOCULTURAL IMPORTANCE, AND CONSERVATION IMPLICATIONS OF MEDICINAL PLANTS IN RURAL COMMUNITIES OF THE BRAZILIAN CAATINGA

CONHECIMENTO ECOLÓGICO TRADICIONAL, IMPORTÂNCIA BIOCULTURAL E IMPLICAÇÕES PARA A CONSERVAÇÃO DE PLANTAS MEDICINAIS EM COMUNIDADES RURAIS DA CAATINGA BRASILEIRA

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ABSTRACT

Traditional medicinal knowledge remains an important component of healthcare systems in rural regions, particularly in socioecological contexts where access to formal medical services is limited. However, the mechanisms through which local communities select, validate, and prioritize medicinal plant species remain insufficiently understood in many areas of the Brazilian Caatinga. This study investigated the biocultural importance, cultural consensus patterns, and conservation implications of medicinal plants used by rural communities in southeastern Piauí, Brazil. A quali-quantitative ethnobotanical approach was adopted, involving semi-structured interviews, direct observation, and photographic records with 29 local knowledge holders from three rural communities. Ethnobotanical data were analyzed using Frequency of Citation (FC), Use Value (UV), Fidelity Level (FL), and Informant Consensus Factor (ICF). The survey documented 61 medicinal plant species distributed across 36 botanical families. Native species predominated among the most culturally important taxa, with Amburana cearensis, Croton conduplicatus, and Myracrodruon urundeuva exhibiting the highest values of cultural importance and therapeutic versatility. Digestive and respiratory disorders presented the highest levels of cultural consensus. The findings indicate that local medicinal systems are structured around a relatively small group of culturally prominent species selected through processes involving therapeutic versatility, perceived efficacy, and intergenerational knowledge transmission. These species simultaneously represent key components of local healthcare systems and potential priorities for conservation. The study highlights the role of Traditional Ecological Knowledge in maintaining biocultural relationships within the Caatinga and underscores the need for conservation strategies integrating biodiversity protection and the safeguarding of traditional

knowledge.
Keywords: Ethnopharmacology; Cultural Consensus; Therapeutic Versatility; Rural Healthcare; Seasonally Dry Tropical Forest.

RESUMO

O conhecimento medicinal tradicional permanece como um componente relevante dos sistemas de saúde em áreas rurais, especialmente em contextos socioecológicos onde o acesso aos serviços formais de saúde é limitado. Entretanto, os mecanismos pelos quais as comunidades locais selecionam, validam e priorizam espécies medicinais ainda são insuficientemente compreendidos em diversas áreas da Caatinga brasileira. Este estudo investigou a importância biocultural, os padrões de consenso cultural e as implicações conservacionistas das plantas medicinais utilizadas por comunidades rurais do sudeste do Piauí, Brasil. Adotou-se uma abordagem etnobotânica quali-quantitativa, baseada em entrevistas semiestruturadas, observação direta e registros fotográficos realizados com 29 detentores de conhecimento local distribuídos em três comunidades rurais. Os dados foram analisados por meio dos índices de Frequência de Citação (FC), Valor de Uso (UV), Nível de Fidelidade (FL) e Fator de Consenso dos Informantes (ICF). Foram registradas 61 espécies medicinais pertencentes a 36 famílias botânicas. As espécies nativas apresentaram maior destaque entre os táxons culturalmente mais importantes, sendo Amburana cearensis, Croton conduplicatus e Myracrodruon urundeuva aquelas com maiores valores de importância cultural e versatilidade terapêutica. As categorias relacionadas aos distúrbios digestivos e respiratórios apresentaram os maiores níveis de consenso cultural. Os resultados indicam que os sistemas medicinais locais são estruturados em torno de um conjunto relativamente reduzido de espécies culturalmente proeminentes, selecionadas por processos

associados à versatilidade terapêutica, à eficácia percebida e à transmissão intergeracional do conhecimento. Essas espécies representam simultaneamente recursos centrais para os sistemas locais de saúde e potenciais prioridades para conservação. O estudo evidencia a importância do Conhecimento Ecológico Tradicional na manutenção das relações bioculturais da Caatinga e reforça a necessidade de estratégias de conservação que integrem proteção da biodiversidade e salvaguarda dos saberes tradicionais.
Palavras-chave: Dysbiosis; Food Sovereignty; School Inclusion; Neurodevelopment; Regenerative Pedagogy.

1. INTRODUCTION

Medicinal plants remain an important component of primary healthcare systems, particularly in rural regions where access to biomedical services is limited or irregular. Despite advances in pharmaceutical sciences and public health infrastructure, traditional medicine continues to influence therapeutic decision-making and constitutes a dynamic system shaped by empirical experience, cultural values, and local biodiversity (WHO, 2025; Albuquerque et al., 2017). Recent ethnobiological research has challenged the notion that traditional medicinal systems represent static remnants of the past, demonstrating instead their adaptive capacity in response to social, environmental, and economic transformations. Such processes are especially relevant in semiarid environments, where ecological constraints and limited healthcare coverage reinforce the importance of local therapeutic resources (Bussmann et al., 2025).

Traditional Ecological Knowledge (TEK) provides an important framework for understanding how medicinal plants are selected, managed, and transmitted within local communities. This body of

knowledge encompasses accumulated experiences, practices, and beliefs developed through long-term interactions between human populations and their environments, extending beyond the simple identification of useful species to include perceptions of efficacy, availability, and ecological dynamics (Albuquerque et al., 2017).

Evidence from different regions indicates that medicinal plant knowledge is unevenly distributed among social groups and remains strongly associated with cultural transmission processes and everyday interactions with natural resources (Mota et al., 2021). Investigations conducted in seasonally dry tropical forests have further demonstrated that local medicinal systems emerge from the interaction between ecological opportunities and cultural preferences, producing distinctive patterns of species use and valuation (Medeiros; Soldati; Albuquerque, 2020).

Growing recognition of the interdependence between biological and cultural diversity has stimulated the development of biocultural approaches in ethnobotanical research. Under this perspective, medicinal plants are understood not only as therapeutic resources but also as components of local identity, memory, and environmental knowledge (Soldati et al., 2024). Such relationships acquire particular importance in the Caatinga, a biome characterized by high ecological uniqueness and relatively low levels of formal protection, where biodiversity loss and knowledge erosion may occur simultaneously (Koch; Almeida-Cortez; Kleinschmit, 2017). Recent studies have demonstrated that species occupying central positions within local pharmacopoeias frequently represent priority targets for conservation initiatives because of their cultural relevance and recurrent use by traditional communities (Santoro et al., 2025).

The Caatinga harbors a rich medicinal flora that has historically supported local healthcare practices throughout northeastern Brazil. Ethnobotanical investigations have documented extensive knowledge regarding both native and cultivated species, revealing patterns of therapeutic versatility, cultural agreement, and resource use that contribute to the maintenance of traditional healthcare systems (Magalhães et al., 2019). Previous studies have also shown that a relatively small number of species often concentrate high levels of cultural importance and medicinal applications, while some native taxa face increasing conservation concerns due to intensive harvesting practices, particularly when bark and roots are frequently collected (Santos et al., 2017; Santos et al., 2018; Souza Machado et al., 2024).

Simultaneously, rapid socioeconomic transformations have intensified debates regarding the continuity of traditional medicinal knowledge. Although contemporary evidence suggests that local knowledge systems remain adaptive and resilient, processes associated with urbanization, migration, educational changes, and shifting livelihood strategies may alter patterns of medicinal plant use and intergenerational transmission (Bussmann et al., 2025). Similar tendencies have been reported in Brazilian traditional communities, where younger generations often exhibit lower familiarity with medicinal resources than older knowledge holders, raising concerns about the future maintenance of local healthcare systems and associated biocultural heritage (Mota et al., 2021; Cantalice et al., 2025).

Despite the growing body of ethnobotanical research conducted in the Caatinga, southeastern Piauí remains poorly represented in the scientific literature. Furthermore, existing investigations have

predominantly emphasized species inventories and descriptive documentation, whereas analytical approaches integrating cultural consensus, use value, and conservation implications remain relatively scarce. As a consequence, the mechanisms through which local communities select, validate, and prioritize medicinal species are still insufficiently understood. Addressing this gap is particularly relevant for identifying species that simultaneously exhibit high cultural importance and potential conservation significance.

Based on this context, the present study addresses the following research question: How does traditional ecological knowledge influence the selection and valuation of medicinal plants in rural communities of southeastern Piauí, and what are the implications of these processes for biocultural conservation in the Caatinga? Three hypotheses guided the investigation: (H1) native Caatinga species exhibit greater biocultural importance than exotic medicinal species; (H2) species presenting higher levels of cultural consensus tend to show greater therapeutic versatility; and (H3) local medicinal knowledge is structured around a reduced group of culturally prominent species that may represent priorities for conservation actions.

Accordingly, this study aimed to investigate the biocultural importance, cultural consensus patterns, and conservation implications of medicinal plants used by rural communities in southeastern Piauí, Brazil. Specifically, the research sought to document medicinal plant species and their therapeutic applications, evaluate cultural importance through ethnobotanical indices, compare the contribution of native and exotic species within the local medicinal system, identify culturally prominent medicinal plants, and discuss the implications of observed use patterns for

biodiversity conservation and the preservation of biocultural heritage in the Caatinga biome.

2. MATERIALS AND METHODS

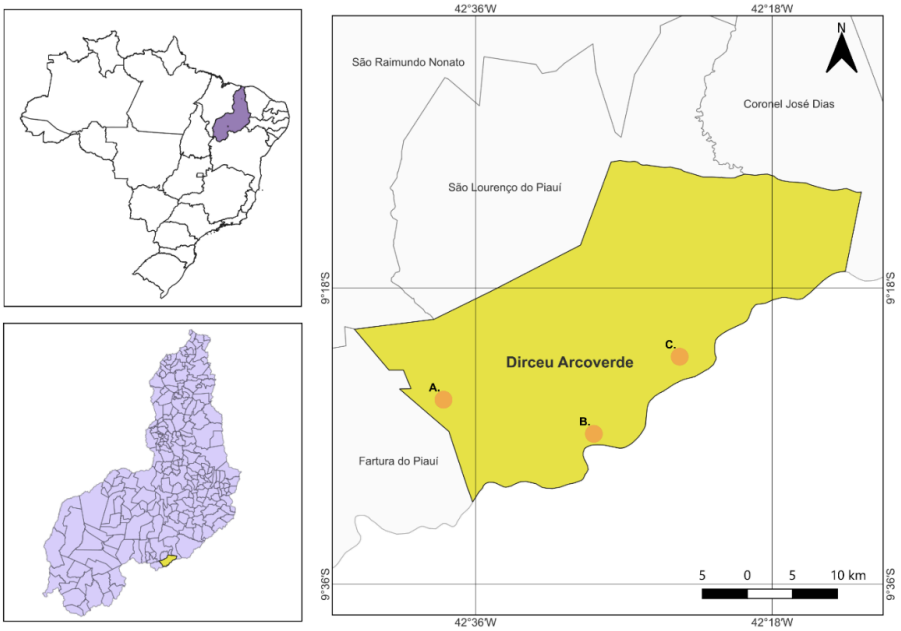
2.1. Study Area

The study was conducted in the municipality of Dirceu Arcoverde, located in southeastern Piauí, northeastern Brazil. This region is part of the Brazilian semiarid domain and is inserted in the Caatinga biome, a seasonally dry tropical forest characterized by high environmental heterogeneity, marked climatic seasonality, irregular rainfall, prolonged dry periods, and vegetation adapted to water scarcity. The municipality is situated near the Serra da Capivara region and presents rural landscapes shaped by small scale agriculture, livestock activities, extractive practices, and direct dependence on local natural resources.

Ecologically, the study area is dominated by xerophytic vegetation formations composed of arboreal, shrubby, and herbaceous strata, with species adapted to high temperatures, intense solar radiation, and seasonal drought. Such environmental conditions influence both the availability of medicinal plants and the ways in which local communities perceive, select, and manage therapeutic resources. In conservation terms, the Caatinga represents one of the most distinctive dry forest ecosystems in Brazil, although it remains insufficiently protected and increasingly affected by land use change, habitat fragmentation, and pressure on native plant resources (Koch; Almeida-Cortez; Kleinschmit, 2017).

Figure 1: Geographic location of Dirceu Arcoverde municipality and the rural communities of Lagoa do Leandro, Gonçalo, and Sítio Novo,

southeastern Piauí, northeastern Brazil.



The municipality is located within the Brazilian semiarid region and exhibits the environmental characteristics typically associated with the Caatinga biome, including high temperatures, seasonal rainfall concentration, prolonged drought periods, and marked interannual climatic variability. Such conditions influence the distribution, availability, and management of plant resources, shaping the ecological context in which local medicinal knowledge is developed and maintained.

Vegetation is predominantly composed of seasonally dry tropical forest formations, with arboreal and shrubby species adapted to water scarcity and intense solar radiation. These ecological characteristics contribute to the occurrence of a diverse medicinal flora that supports local healthcare practices and constitutes an important component of regional biocultural heritage.

From a conservation perspective, the study area is situated within a region recognized for its ecological relevance in the Caatinga domain, where native plant resources remain closely associated with rural livelihoods and traditional healthcare systems. This

socioecological setting provides an appropriate context for investigating the relationships between medicinal plant use, traditional ecological knowledge, and biodiversity conservation (Koch; Almeida-Cortez; Kleinschmit, 2017).

The socioeconomic context of Dirceu Arcoverde is marked by rural livelihoods, limited access to specialized healthcare services, and the persistence of local therapeutic practices based on medicinal plants. These conditions make the municipality a relevant setting for investigating the relationship between traditional ecological knowledge, local healthcare strategies, and the conservation of medicinal biodiversity in the semiarid region.

2.2. Communities Investigated

Fieldwork was carried out in three rural communities of Dirceu Arcoverde: Lagoa do Leandro, Gonçalo, and Sítio Novo. These communities were selected because they are located in rural areas where medicinal plant use remains embedded in everyday healthcare practices and where residents maintain direct relationships with native vegetation, home gardens, cultivated species, and locally available therapeutic resources.

Lagoa do Leandro and Gonçalo are located in the southern portion of the municipality, while Sítio Novo is situated toward the western sector. Together, the three communities provide a relevant empirical basis for examining local medicinal plant knowledge across different rural settings within the same municipal territory. Their inclusion allowed the study to capture both shared ethnobotanical patterns and possible variations in species use, therapeutic indications, and knowledge distribution among local residents.

2.3. Sampling Strategy And Informant Selection

The study adopted a purposive sampling strategy, focusing on adult residents recognized in their communities as holders of knowledge about medicinal plant use. Informants were selected according to three main criteria: being 18 years of age or older, residing in one of the investigated communities, and possessing practical knowledge regarding the preparation, indication, or use of medicinal plants. This strategy was appropriate because the research aimed not to estimate medicinal plant knowledge in the general population, but to understand culturally relevant knowledge maintained by local specialists and experienced residents.

The initial participants were identified during community visits and informal conversations with residents. Subsequently, the snowball technique was used to locate additional informants through local referrals, following standard procedures in ethnobotanical field research (Martin, 1995). This approach enabled the identification of people considered knowledgeable by their peers, including older residents, women involved in family healthcare, and individuals frequently consulted for plant based remedies.

Data collection continued until theoretical saturation was reached, that is, until new interviews no longer produced substantially different information regarding medicinal species, therapeutic categories, preparation methods, and locally recognized uses. A total of 29 informants participated in the study, representing different age groups, genders, schooling levels, and income profiles. This sample size is compatible with qualitative and quantitative ethnobotanical studies centered on key informants and local knowledge holders,

particularly when saturation and cultural consensus are used as methodological criteria.

2.4. Ethical Procedures And Access To Traditional Knowledge

All procedures involving human participants followed the ethical principles applicable to research in the humanities and social sciences in Brazil, particularly Resolution No. 510 of the National Health Council. Before each interview, participants received clear information about the objectives of the study, the voluntary nature of participation, the type of information requested, the confidentiality of personal data, and the possibility of withdrawing at any moment without any negative consequence.

Participation occurred only after prior informed consent. The Free and Informed Consent Form was presented to the informants, and written consent was obtained whenever applicable. Authorization for photographic records was also requested separately, especially when images involved people, preparation practices, or identifiable domestic spaces. Personal names were not associated with ethnobotanical records in the analytical database, preserving confidentiality and reducing the risk of exposing individual knowledge holders.

Because the study involved access to associated traditional knowledge regarding the medicinal use of plant species, the research was registered in the National System for the Management of Genetic Heritage and Associated Traditional Knowledge, SisGen, under registration number A92B9D3. This procedure ensured compliance with Brazilian legislation concerning access to traditional knowledge associated with biodiversity.

2.5. Ethnobotanical Data Collection

Ethnobotanical data were collected between November 2025 and February 2026 through structured and semi structured interviews, complemented by informal conversations, direct observation, and photographic records. The field procedures followed classical ethnobotanical recommendations for documenting local plant knowledge, therapeutic practices, and cultural uses of biodiversity (Martin, 1995; Albuquerque; Lucena; Cunha, 2019).

The interviews collected information on socioeconomic characteristics of informants, vernacular names of medicinal plants, therapeutic indications, plant parts used, preparation methods, modes of administration, perceived efficacy, origin of species, and contexts of use. Open ended questions allowed informants to describe their experiences and explain how specific plants were selected, prepared, and transmitted within families or community networks. Structured questions ensured comparability among interviews and enabled the calculation of quantitative ethnobotanical indices.

Direct observation was used to verify preparation practices, plant availability, and local contexts of use. When permitted, photographic records were made to support botanical identification and document relevant procedures, such as the preparation of remedies. Field notes were produced throughout the research process in order to register contextual information that could not be fully captured through interview forms, including comments on knowledge transmission, resource access, and the perceived importance of specific species.

2.6. Botanical Identification

Medicinal plants cited by informants were initially recorded by their vernacular names. Whenever possible, the researchers photographed the cited species in home gardens, backyards, cultivated areas, or surrounding vegetation. These photographic records were used as auxiliary material for taxonomic identification, together with information provided by informants regarding morphology, habitat, plant part used, and local availability.

Taxonomic identification was carried out through comparison with botanical references and herbarium materials available at regional institutions, including the Laure Emperaire Herbarium of Fundação Museu do Homem Americano and the Herbarium São Raimundo Nonato of Universidade Estadual do Piauí. Scientific names, botanical families, and authorship were checked and updated according to accepted taxonomic databases. Species whose identification could not be confirmed at the species level were maintained at the genus level and treated cautiously in the analysis.

For a Q1 submission, the manuscript must clearly indicate the level of taxonomic certainty for each record. Whenever voucher specimens are available, voucher numbers should be included in the main table or supplementary material. When identification is based only on photographs and local descriptions, this limitation should be explicitly stated, since taxonomic precision is essential for reproducibility, comparison with other studies, and conservation interpretation.

2.7. Data Analysis

The analysis combined descriptive ethnobotanical procedures with quantitative indices designed to evaluate cultural importance, consensus, and therapeutic relevance. All plant use records were organized in a database containing informant code, community, vernacular name, scientific name, botanical family, origin, plant part used, preparation method, therapeutic indication, and therapeutic category.

Therapeutic indications were grouped into broader categories according to the body system or health condition reported by the informants. This classification allowed the calculation of consensus measures and facilitated comparison with previous ethnobotanical studies. Quantitative analyses were performed using spreadsheet software, with formulas checked manually to ensure consistency between the number of informants, use reports, taxa, and therapeutic categories.

2.7.1. Descriptive Ethnobotanical Analysis

Descriptive analysis was used to characterize the medicinal flora recorded in the three communities. The following variables were summarized: number of species, genera and botanical families, number of use reports, origin of species, plant parts used, preparation methods, therapeutic categories, and most frequently cited taxa. Percentages were calculated based on the total number of records in each analytical category.

This stage provided the empirical basis for identifying dominant botanical families, recurrent therapeutic uses, and general patterns of medicinal plant use. Rather than treating these results as a simple inventory, the descriptive analysis was used as a first step toward

interpreting how local communities organize medicinal knowledge and prioritize certain plant resources.

2.7.2. Frequency Of Citation (FC)

Frequency of Citation was calculated to estimate the relative prominence of each medicinal species among informants. This index indicates how widely a species is recognized within the local medicinal system and was calculated according to the following formula:

$$FC = Ni / N$$

where Ni represents the number of informants who cited a given species, and N represents the total number of informants interviewed.

Higher FC values indicate species more frequently mentioned by knowledge holders and therefore more widely recognized within the communities. This index was used as a proxy for cultural visibility and local familiarity with each medicinal plant, following principles of quantitative ethnobotany proposed by Phillips and Gentry (1993).

2.7.3. Use Value (UV)

Use Value was calculated to estimate the relative importance of each medicinal species based on the number of use reports attributed to it. The index was calculated according to the formula proposed by Phillips and Gentry (1993):

$$UV = \frac{\sum Ui}{N}$$

where ΣUi corresponds to the total number of use reports recorded for species i, and N corresponds to the total number of informants interviewed.

Species with higher UV values were interpreted as culturally important because they concentrate a larger number of medicinal uses within the local pharmacopoeia. This measure was especially relevant for identifying versatile species used across multiple therapeutic categories and for comparing the importance of native and exotic plants in the local medicinal system.

2.7.4. Informant Consensus Factor (ICF)

The Informant Consensus Factor was used to evaluate the degree of agreement among informants regarding the use of medicinal plants for specific therapeutic categories. The index was calculated according to Trotter and Logan (1986):

$$ICF = \frac{(Nur - Nt)}{(Nur - 1)}$$

where Nur represents the number of use reports within a therapeutic category, and Nt represents the number of taxa used in that same category.

ICF values range from 0 to 1. Values closer to 1 indicate high agreement among informants, suggesting that relatively few species are widely recognized for treating a given group of ailments. Lower values indicate more dispersed knowledge, with many species cited for the same category and less shared consensus among participants. In this study, ICF was used to identify

therapeutic categories with greater cultural consolidation and potential ethnopharmacological relevance.

2.7.5. Fidelity Level (FL)

Fidelity Level was calculated to determine the degree to which a species was consistently associated with a particular therapeutic indication or category. The index followed Friedman et al. (1986) and was calculated as:

$$FL = (\frac{Np}{N}) \times 100$$

where Np represents the number of informants who cited a species for a specific therapeutic purpose, and N represents the total number of informants who mentioned that species for any medicinal use.

Higher FL values indicate stronger cultural specificity, meaning that a given plant is preferentially associated with a particular therapeutic use. This index was used to distinguish highly versatile species from species with more specialized medicinal roles within local knowledge systems.

2.7.6. Native Versus Exotic Species Analysis

Each medicinal species was classified as native or exotic according to its origin in relation to the Brazilian flora and the Caatinga context. This classification allowed comparison between native and exotic taxa regarding species richness, citation frequency, use value, therapeutic versatility, and presence among the most culturally important plants.

The analysis was designed to test whether native species occupy a more central role in the local medicinal system than exotic species. Special attention was given to native taxa with high citation frequency, elevated use value, multiple therapeutic applications, and recurrent use of plant parts associated with greater extraction pressure, such as bark and roots. This procedure supported the interpretation of conservation implications derived from ethnobotanical importance.

2.7.7. Identification Of Culturally Important Medicinal Species

Culturally important medicinal species were identified through the integrated interpretation of four complementary indicators: Frequency of Citation, Use Value, Fidelity Level, and Informant Consensus Factor. FC was used to assess how widely a species was recognized among informants. UV measured the diversity and intensity of medicinal uses attributed to each species. FL indicated the degree of therapeutic specificity. ICF identified the therapeutic categories with stronger cultural agreement.

Species were considered culturally prominent when they combined high citation frequency, elevated use value, relevant fidelity level, and association with therapeutic categories showing high informant consensus. This integrative approach avoided reliance on a single index and allowed the identification of species occupying central positions within local traditional ecological knowledge.

The final interpretation considered not only numerical values but also ecological origin, plant part used, therapeutic versatility, and potential conservation pressure. Native species with high cultural importance and use of bark, roots, or other structures whose

extraction may affect plant survival were treated as priority taxa for discussion on biocultural conservation in the Caatinga.

3. RESULTS

3.1. Socioeconomic Profile Of Knowledge Holders

A total of 29 informants participated in the study, representing a diverse group of local knowledge holders distributed across the three investigated communities. Women accounted for 62.06% of the participants (n = 18), whereas men represented 37.93% (n = 11), indicating a greater female participation in the maintenance and transmission of medicinal plant knowledge. This distribution suggests that women play a central role in household healthcare practices and in the preservation of local therapeutic traditions.

Age distribution revealed a predominance of older individuals. Participants aged between 51 and 70 years represented nearly half of the sample, while younger age groups accounted for a substantially smaller proportion. Such a pattern indicates that medicinal plant knowledge remains strongly concentrated among older generations, reflecting long-term experiential learning and cumulative interactions with local biodiversity.

Educational attainment was generally low. Most informants reported incomplete elementary education, while a considerable proportion had never completed formal schooling. Only a small number of participants reported educational levels beyond elementary education. Regarding income, the majority of respondents reported monthly earnings equal to or greater than one minimum wage, although lower income levels were also represented within the sample.

Table 1: Socioeconomic data from informants interviewed in rural communities in the municipality of Dirceu Arcoverde, state of Piauí, Brazil.

Socioeconomic Category	Cases	Number	%
Gender	Female	18	62.06
	Male	11	37.93
Age	20-30 years	3	10.34
	31-40 years	3	10.34
	41-50 years	6	20.68
	51-60 years	8	27.58
	61-70 years	6	20.68
	>70 years	3	10.34
Schooling Level	Out of school	8	27.58
	Incomplete Elementary School	17	58.62
	Incomplete Middle School	2	6.89
	Literate	2	6.89
Rent	< A minimum Wage	7	24.13
	A Minimum Wage	10	34.48
	> A Minimum Wage	12	41.37

Source: The authors themselves.

Collectively, these findings indicate that medicinal plant knowledge in the studied communities is primarily maintained by older rural residents with limited formal education and substantial practical experience regarding local healthcare practices.

3.2. Diversity Of Medicinal Flora

The survey documented a total of 61 medicinal plant species distributed among 56 genera and 36 botanical families, corresponding to 353 medicinal use reports. This richness reflects a broad local pharmacopoeia and demonstrates the continued importance of plant resources within community healthcare systems.

Fabaceae was the most representative family in terms of species richness and citation frequency, followed by Lamiaceae and Euphorbiaceae. Together, these families accounted for a substantial proportion of the medicinal flora recorded in the study area. Other relevant families included Anacardiaceae, Amaryllidaceae, Asteraceae, and Burseraceae, although with lower levels of representation.

Species richness was not evenly distributed among families. A relatively small number of taxonomic groups concentrated a considerable portion of medicinal knowledge, while most families were represented by only one or two species. Such concentration suggests that local medicinal systems are organized around a limited set of botanical groups that provide a wide range of therapeutic resources.

Table 2: Medicinal plants used in communities in the city of Dirceu Arcoverde, Piauí, Northeast Brazil.

Family/Scientific name	VN	TC	PU	PM	O
Amaranthaceae					
Dysphania ambrosioides (L.) Mosyakin &	**mastruz**	Skin, Musculoskeletal, Genitourinary,	Leaf	Fresh, infused, macerated	N

⚠ Esta tabela possui muitas colunas e foi cortada para impressão. Para visualizá-la completa, acesse o artigo original em: https://revistatopicos.com.br/artigos/traditional-ecological-knowledge-biocultural-importance-and-conservation-implications-of-medicinal-plants-in-rural-communities-of-the-brazilian-caatinga?noblockage

Abbreviations: VN = Vernacular Name; TC = Therapeutic Category; PU = Part Used; PM = Preparation Method; O = Origin (N = native; E = exotic); Frequency of Citation (FC); Use Value (UV).
Source: The authors themselves.

The documented diversity highlights the importance of the Caatinga flora and associated cultivated species as a reservoir of medicinal resources used to address multiple healthcare needs within the studied communities.

3.3. Native And Exotic Species Patterns

Among the 61 recorded species, 34 were classified as native and 27 as exotic, corresponding to 55.74% and 44.26% of the medicinal flora, respectively. Although both groups contributed substantially to local healthcare practices, native species occupied a more prominent position within the medicinal system.

The most frequently cited plants and those presenting the highest use values were predominantly native taxa associated with the Caatinga biome. Amburana cearensis, Croton conduplicatus, and Myracrodruon urundeuva emerged as particularly important examples, combining high citation frequencies with broad therapeutic applicability. In contrast, exotic species tended to occupy complementary positions within the local pharmacopoeia, despite some notable exceptions.

These results provide initial evidence that medicinal plant selection is not solely determined by availability or cultivation practices. Rather, cultural familiarity, historical use, and accumulated therapeutic experience appear to contribute to the prominence of native species within local medicinal knowledge systems.

3.4. Culturally Important Medicinal Plants

The integration of Frequency of Citation (FC), Use Value (UV), and Fidelity Level (FL) revealed substantial differences among recorded species regarding their cultural prominence and therapeutic relevance.

Amburana cearensis emerged as the most culturally important species documented in the study. This species presented the highest citation frequency and use value, being associated with multiple therapeutic categories, including respiratory, gastrointestinal, neurological, infectious, cardiovascular, and systemic disorders. Its broad medicinal versatility and recurrent citation by informants indicate a central role within local traditional healthcare systems.

Croton conduplicatus ranked second in overall importance, displaying elevated citation frequency and use value. Informants associated this species with gastrointestinal, respiratory, infectious, neurological, and general health conditions, reinforcing its relevance as a multifunctional medicinal resource.

Myracrodruon urundeuva also demonstrated high cultural importance. The species was frequently cited for treating inflammatory conditions, infections, musculoskeletal disorders, and genitourinary problems. Its occurrence across several therapeutic categories reflects its recognized medicinal versatility among local residents.

Among the exotic taxa, Rosmarinus officinalis was the most prominent species. Despite its non-native origin, it presented high citation frequency and use value, being widely employed in the treatment of respiratory, neurological, cardiovascular, and infectious conditions.

Table 3: Main culturally important medicinal species based on frequency of citation (FC), use value (UV), and fidelity level (FL) in rural communities of southeastern Piauí, Brazil.

Species	Origin	FC	UV	Highest FL (%)	Mai Therap ic Categ
Amburana cearensis	Native	0.9310	2.0344	68.96	Digest Disord

⚠ Esta tabela possui muitas colunas e foi cortada para impressão. Para visualizá-la completa, acesse o artigo original em: https://revistatopicos.com.br/artigos/traditional-ecological-knowledge-biocultural-importance-and-conservation-implications-of-medicinal-plants-in-rural-communities-of-the-brazilian-caatinga?noblockage

Abbreviations: FC = Frequency of Citation; UV = Use Value; FL = Fidelity Level.
Source: The authors themselves.

Taken together, these findings indicate that local medicinal knowledge is strongly structured around a relatively small set of highly valued species that concentrate therapeutic versatility, cultural recognition, and recurrent use.

3.5. Therapeutic Categories And Cultural Consensus

Medicinal uses reported by informants were grouped into ten therapeutic categories. Digestive system disorders exhibited the highest Informant Consensus Factor (ICF = 0.81), followed by respiratory disorders (ICF = 0.76). Neurological conditions presented intermediate levels of consensus (ICF = 0.57), whereas musculoskeletal and dermatological categories displayed lower agreement among participants.

The high consensus observed for digestive and respiratory ailments indicates that relatively few species are consistently recognized for treating these conditions. Such concentration of knowledge suggests stronger cultural validation and greater agreement regarding the perceived efficacy of particular medicinal resources.

Respiratory disorders generated 120 use reports distributed among 29 taxa, whereas digestive disorders accounted for 150 use reports involving the same number of taxa. These categories also concentrated several of the species with the highest use values and fidelity levels recorded in the study.

Categories associated with skin conditions, musculoskeletal disorders, and general health complaints displayed lower consensus values, reflecting greater diversity in therapeutic choices and less standardized treatment practices within the communities.

Table 4: Therapeutic categories, reported health conditions, use reports, taxa richness, informant consensus factor (ICF), and culturally prominent medicinal species in rural communities of southeastern Piauí, Brazil.

Therapeutic Category	Reported Health Conditions	Use Reports (Nur)	Number of Taxa (Nt)	ICF	Domin Speci
Respiratory Disorders	Flu, cold, sore throat, hoarseness, sinusitis, bronchitis, pharyngiti	120	29	0.7647	*Ambur cearer*

Abbreviations: Nur = Number of use reports; Nt = Number of taxa; ICF = Informant Consensus Factor; FL = Fidelity Level.
Source: The authors themselves.

Overall, the observed consensus patterns reveal that medicinal knowledge is not uniformly distributed across therapeutic domains, with some health conditions exhibiting stronger cultural agreement than others.

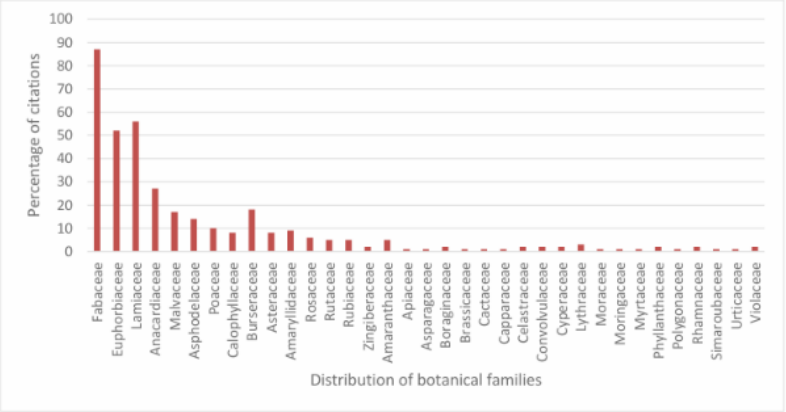
3.6. Plant Parts And Preparation Methods

Leaves represented the most frequently used plant structure, accounting for 41.37% of all medicinal indications. Bark occupied the second position, representing 34.93% of records, followed by seeds, roots, inner bark, and fruits. This pattern demonstrates a strong reliance on vegetative structures, particularly those that are easily accessible and available throughout much of the year.

Preparation methods were dominated by infusion and maceration, which together accounted for most medicinal formulations reported by informants. Decoction also represented an important preparation technique, especially for bark and root based remedies. Fresh preparations, homemade syrups, and capsule formulations were reported less frequently.

The predominance of infusions, macerations, and decoctions reflects a medicinal system based on simple and locally accessible preparation procedures. Simultaneously, the extensive use of bark and roots highlights the importance of woody native species within the local pharmacopoeia and raises questions regarding the long-term sustainability of some harvesting practices.

Figure 2: Percentage distribution of medicinal plant families based on citation frequency in rural communities of southeastern Piauí, Brazil.



Source: The authors themselves.

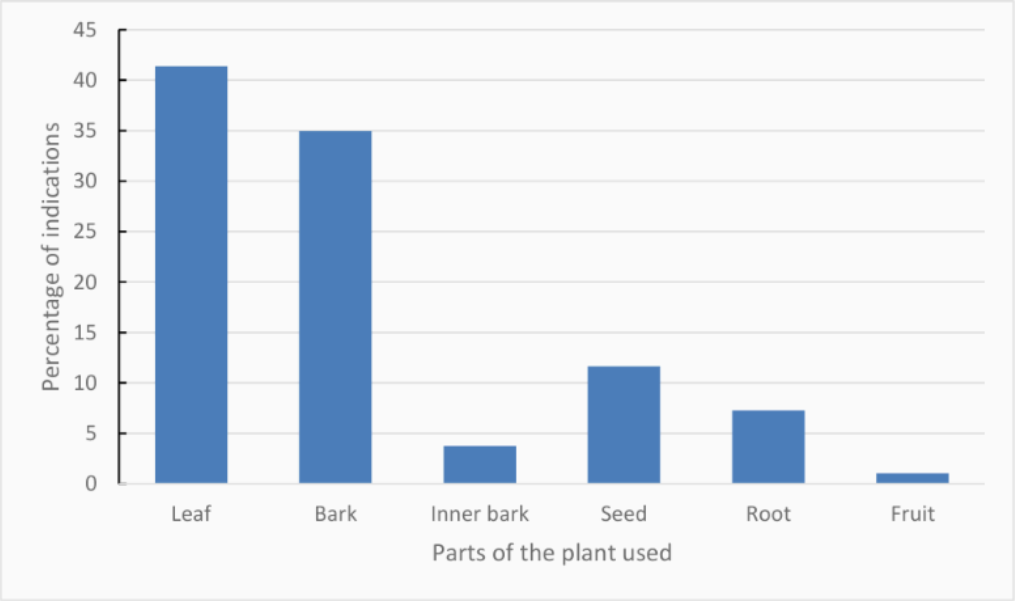
Fabaceae was the most representative family in the local pharmacopoeia, accounting for the highest proportion of citations among all recorded medicinal plants. Euphorbiaceae and Lamiaceae also occupied prominent positions, while the remaining families exhibited comparatively lower levels of representation. This pattern suggests that medicinal knowledge in the studied communities is concentrated around a relatively small group of taxonomic lineages that provide a substantial portion of locally recognized therapeutic resources.

The predominance of Fabaceae is consistent with previous ethnobotanical investigations conducted in the Caatinga, where species belonging to this family frequently combine ecological abundance, broad geographic distribution, and diverse medicinal applications (Magalhães et al., 2019; Santos et al., 2018). Several of the most culturally important species identified in the present study, including Amburana cearensis and Poincianella pyramidalis, belong to this family, reinforcing its relevance within local healthcare systems.

Elevated representation of Euphorbiaceae also reflects a recurrent pattern observed in seasonally dry tropical forests of northeastern Brazil. Members of this family are often associated with traditional medicinal practices due to their availability in semiarid environments and their perceived efficacy in treating a wide range of health conditions (Siqueira et al., 2020). Likewise, the prominence of Lamiaceae appears closely linked to the incorporation of cultivated medicinal plants into household therapeutic practices, particularly species characterized by aromatic properties and frequent use in respiratory and digestive disorders.

Rather than reflecting only the botanical composition of the surrounding vegetation, the observed distribution of medicinal plant families appears to result from a selective cultural process through which local communities identify, validate, and transmit knowledge regarding specific therapeutic resources. Such a pattern supports the interpretation that medicinal plant selection is influenced not only by ecological availability but also by accumulated cultural experience and shared perceptions of efficacy, a phenomenon frequently highlighted in studies addressing traditional ecological knowledge and biocultural adaptation (Albuquerque et al., 2017; Medeiros; Soldati; Albuquerque, 2020).

Figure 3: Plant parts used in medicinal preparations reported by rural communities of southeastern Piauí, Brazil.



Source: The authors themselves.

Leaves represented the most frequently used plant structure in the medicinal preparations reported by informants, followed by bark, seeds, roots, inner bark, and fruits. This pattern is consistent with findings from other ethnobotanical studies conducted in the Caatinga and reflects both the accessibility of plant resources and the accumulated experience of local communities regarding the collection and preparation of medicinal remedies (Magalhães et al., 2019; Souza Machado et al., 2024).

The predominance of leaves may be associated with practical and ecological factors. Leaves are generally easier to collect, available during much of the year, and can often be harvested without causing severe damage to individual plants. Such characteristics tend to favor their incorporation into local therapeutic practices and may contribute to more sustainable forms of resource use. Similar patterns have been reported in different semiarid regions, where leaf harvesting represents an adaptive strategy that reconciles medicinal needs with the maintenance of plant populations (Medeiros; Soldati; Albuquerque, 2020).

Conversely, the substantial use of bark deserves particular attention from a conservation perspective. Several of the most culturally important species identified in this study, including *Amburana cearensis* and *Myracrodruon urundeuva*, are frequently exploited through bark extraction. Unlike leaf harvesting, bark removal may compromise physiological processes, reduce individual fitness, and increase mortality when extraction occurs repeatedly or without adequate management practices (Santos et al., 2017). The prominence of bark among the recorded plant parts therefore suggests that some medicinal species may be exposed to greater harvesting pressure, especially when they simultaneously exhibit high cultural importance and broad therapeutic applicability.

Roots and inner bark were cited less frequently but also deserve consideration because their collection often involves more destructive extraction practices. The use of these structures may reflect perceptions of greater medicinal potency, a phenomenon documented in traditional medicinal systems where certain plant organs are culturally associated with stronger therapeutic effects (Albuquerque et al., 2017). Such perceptions contribute to the persistence of harvesting practices that may generate additional conservation concerns for native species.

Taken together, these findings indicate that plant part selection is not merely a consequence of resource availability. Rather, it appears to result from the interaction between ecological conditions, cultural preferences, therapeutic experience, and locally transmitted knowledge. Understanding these patterns is essential for identifying species potentially vulnerable to harvesting pressure and for developing conservation strategies that consider both biological

sustainability and the cultural importance of medicinal plants within rural communities (Soldati et al., 2024; Santoro et al., 2025).

3.7. Species With Highest Conservation Relevance

The integration of cultural importance indicators with ecological origin revealed a subset of species that deserve particular attention from a conservation perspective. Amburana cearensis, Croton conduplicatus, and Myracrodruon urundeuva combined high use values, elevated cultural recognition, multiple therapeutic applications, and strong participation in therapeutic categories characterized by high consensus among informants.

These species occupy central positions within local medicinal knowledge and simultaneously depend on plant structures such as bark, roots, or woody tissues whose extraction may increase pressure on natural populations. Their recurrent use across different therapeutic categories further amplifies their importance within community healthcare systems.

Although Rosmarinus officinalis also displayed high cultural importance, its cultivated and exotic status suggests a lower conservation concern when compared to native Caatinga species. Consequently, the greatest conservation relevance was concentrated among native taxa that combine biological significance with elevated biocultural value.

The integration of ethnobotanical importance indicators with ecological origin and therapeutic versatility enabled the identification of species that may be considered particularly relevant from a biocultural conservation perspective. Rather than focusing exclusively on citation frequency or medicinal use intensity, this

analysis considered the combined influence of use value, fidelity level, species origin, and the breadth of therapeutic applications. Such an approach allows the identification of medicinal plants that simultaneously occupy central positions within local healthcare systems and may experience greater harvesting pressure due to their cultural prominence and recurrent use.

Table 5: Species with highest conservation relevance according to origin, use value (UV), fidelity level (FL), and therapeutic versatility in rural communities of southeastern Piauí, Brazil.

Species	Origin	UV	Highest FL (%)	Number of Therapeutic Categories
Amburana cearensis	Native	2.03	68.96	7
Croton conduplicatus	Native	1.17	34.48*	6
Myracrodruon urundeuva	Native	0.83	27.58	8
Poincianella pyramidalis	Native	0.76	20.68*	4
Commiphora leptophloeos	Native	0.62	20.68	3
Croton sonderianus	Native	0.62	17.24*	3

*Values derived from the dominant therapeutic category associated with the species in the ethnobotanical records.

Source: The authors themselves.

The species identified in Table 5 reveal a clear concentration of medicinal knowledge around a relatively small group of native Caatinga taxa. Among them, *Amburana cearensis* stands out due to its exceptionally high use value, elevated fidelity level, and broad therapeutic versatility, being cited for the treatment of respiratory, digestive, neurological, cardiovascular, infectious, and systemic disorders. Similar patterns were observed for *Croton conduplicatus* and *Myracrodruon urundeuva*, both of which exhibited high cultural importance and participation in multiple therapeutic categories. These findings support the hypothesis that local medicinal systems are structured around a reduced set of culturally prominent species whose importance extends beyond simple species richness or citation frequency (Albuquerque et al., 2006; Medeiros; Soldati; Albuquerque, 2020).

From a conservation perspective, the predominance of native species among the most important medicinal resources deserves particular attention. Several of these taxa are harvested through the collection of bark, inner bark, or woody tissues, practices that may increase pressure on natural populations when combined with high demand and repeated use. Previous studies conducted in the Caatinga have similarly identified species such as *Amburana cearensis* and *Myracrodruon urundeuva* as priority medicinal resources due to their ecological importance and cultural relevance (Santos et al., 2017; Magalhães et al., 2019).

The concentration of therapeutic functions within a small number of native species also reinforces the biocultural significance of these plants and highlights the need for conservation strategies capable of integrating biodiversity protection with the safeguarding of

traditional ecological knowledge (Soldati et al., 2024; Santoro et al., 2025).

Taken together, these results suggest that local medicinal knowledge is structured around a reduced group of culturally prominent species whose ecological and therapeutic importance makes them strategic targets for future conservation and ethnopharmacological initiatives.

4. DISCUSSION

4.1. Traditional Ecological Knowledge And Maintenance Of Medicinal Practices

The medicinal knowledge documented in the investigated communities reflects a complex system of interactions between people, biodiversity, and local healthcare practices that has been continuously shaped through generations. Rather than constituting a mere collection of empirical observations, the recorded information reveals a structured body of Traditional Ecological Knowledge (TEK) that guides the identification, selection, preparation, and application of medicinal resources. The persistence of this knowledge among rural populations suggests that medicinal plant use remains an active component of local healthcare systems despite ongoing social and economic transformations.

Particularly noteworthy is the concentration of knowledge among older community members, a pattern frequently reported in ethnobotanical studies conducted in traditional rural contexts. Such a distribution highlights the importance of intergenerational transmission processes in maintaining medicinal practices and ensuring the continuity of local therapeutic systems (Mota et al.,

2021). At the same time, it raises concerns regarding the long-term preservation of this knowledge, especially in settings where younger generations increasingly interact with formal healthcare systems and urban lifestyles.

Findings from seasonally dry tropical forests indicate that medicinal plant use is not solely determined by ecological availability. Cultural experience, historical use, social learning, and perceptions of efficacy also influence the composition of local pharmacopoeias and the persistence of specific therapeutic practices (Medeiros; Soldati; Albuquerque, 2020). The patterns observed in southeastern Piauí reinforce this interpretation, suggesting that medicinal knowledge functions as an adaptive strategy through which communities respond to health needs while maintaining strong relationships with local biodiversity.

The continuity of medicinal practices documented in this study therefore illustrates the resilience of traditional knowledge systems within the Caatinga. Such resilience should not be interpreted as cultural immobility. On the contrary, the coexistence of traditional remedies, cultivated species, and new preparation techniques indicates an ongoing process of adaptation that allows local healthcare systems to remain functional under changing environmental and socioeconomic conditions (Albuquerque et al., 2017).

4.2. Why do a Few Species Dominate Local Medicinal Systems?

One of the most significant findings of this study is the marked concentration of medicinal importance in a relatively small group of species. Although 61 medicinal plants were recorded, only a limited

number accounted for the highest values of citation frequency, use value, fidelity level, and participation across multiple therapeutic categories. Understanding why certain species become culturally dominant is essential for explaining the internal organization of local medicinal systems.

A first explanation can be derived from the versatility hypothesis. According to this perspective, species capable of treating a wide range of health conditions tend to accumulate greater cultural importance because they provide solutions to multiple therapeutic demands. The exceptional performance of species such as Amburana cearensis, Croton conduplicatus, and Myracrodruon urundeuva supports this interpretation. Their occurrence across several therapeutic categories increases the probability of repeated use and reinforces their prominence within local knowledge systems. Similar relationships between therapeutic versatility and cultural importance have been reported in other ethnobotanical studies conducted in the Caatinga (Albuquerque et al., 2006).

A complementary explanation emerges from the concept of utilitarian redundancy. Local medicinal systems frequently contain multiple species capable of treating the same health condition, creating a degree of functional overlap that contributes to system resilience. Nevertheless, not all species occupying similar therapeutic roles receive equivalent cultural recognition. Some taxa become preferentially selected and repeatedly transmitted across generations, while others remain secondary alternatives. Recent studies have demonstrated that medicinal redundancy does not necessarily produce equal cultural importance among species, since social preferences and historical experience may favor particular taxa even when alternative resources are available (Gonçalves et al., 2025).

These observations point toward a broader process of cultural selection. Communities do not use all available plant resources equally. Through repeated experimentation, collective learning, and intergenerational transmission, certain species become culturally validated and progressively incorporated into the core of local medicinal systems. Over time, this process generates a hierarchy of medicinal resources in which a reduced number of plants acquire exceptional prominence. The elevated values of FC, UV, and FL observed for several native species suggest that such a mechanism may be operating in the communities studied here.

Consequently, medicinal plant dominance appears to result from the interaction between ecological availability, therapeutic versatility, utilitarian redundancy, and cultural selection. Species occupying central positions within local healthcare systems are therefore not merely abundant or accessible resources. They represent culturally consolidated therapeutic solutions that have been repeatedly validated through collective experience.

4.3. Native Species as Pillars Of Biocultural Heritage

The predominance of native species among the most culturally important medicinal plants highlights the close relationship between local healthcare systems and the ecological characteristics of the Caatinga biome. Although exotic species contributed substantially to the local pharmacopoeia, the species exhibiting the highest cultural prominence were predominantly native taxa associated with the regional landscape. This pattern suggests that medicinal knowledge remains strongly connected to local biodiversity and reinforces the importance of native flora in sustaining community health practices.

From a biocultural perspective, medicinal plants cannot be understood solely as biological resources. Their significance emerges from the relationships established between communities and ecosystems over long periods of coexistence. Traditional knowledge, therapeutic practices, harvesting techniques, and cultural meanings collectively contribute to transforming certain species into components of local biocultural heritage (Soldati et al., 2024). The recurrent use of native plants recorded in this study reflects precisely this process of co-construction between cultural experience and ecological context.

Research conducted in other traditional communities has demonstrated that native medicinal species frequently occupy strategic positions within local knowledge systems because they are embedded in collective memory, local identities, and everyday healthcare practices (Santoro et al., 2025). Similar dynamics appear to occur in southeastern Piauí, where species such as Amburana cearensis, Croton conduplicatus, and Myracrodruon urundeuva were repeatedly cited and associated with a broad range of therapeutic applications.

This finding acquires additional relevance when considered alongside conservation concerns. Native medicinal species often face pressures associated with habitat loss, land-use change, and extractive harvesting practices. Consequently, the loss of these species may generate simultaneous ecological and cultural impacts, affecting both biodiversity conservation and the continuity of traditional healthcare systems. Previous investigations in the Caatinga have emphasized that some medicinal plants combine high cultural importance with elevated conservation relevance,

making them priority targets for integrated conservation strategies (Santos et al., 2017).

The strong representation of native taxa among the most important medicinal resources therefore supports the interpretation that local healthcare systems contribute to maintaining biocultural relationships that extend beyond therapeutic functions alone. Protecting these species ultimately involves safeguarding ecological processes, cultural memory, and traditional knowledge simultaneously.

4.4. Consensus, Efficacy Perception And Cultural Validation

The high consensus values recorded for digestive and respiratory disorders indicate that medicinal knowledge is not randomly distributed among informants. Instead, certain therapeutic uses are widely shared and repeatedly reproduced across the communities, suggesting the existence of culturally consolidated treatment patterns. Informant consensus has long been interpreted as an indirect indicator of collective agreement regarding the effectiveness and reliability of medicinal resources (Trotter; Logan, 1986).

Species associated with categories exhibiting elevated ICF values are often those that have undergone repeated processes of cultural validation. Through continuous use and social transmission, communities progressively reinforce confidence in specific therapeutic practices while reducing uncertainty regarding treatment options. Under this perspective, consensus emerges not merely as a statistical phenomenon but as a social expression of accumulated experience and collective learning.

The relationship between consensus and perceived efficacy becomes even more evident when considered alongside fidelity level values. High FL scores indicate that a species is consistently associated with particular therapeutic uses, suggesting stronger specialization and clearer cultural recognition of its medicinal role (Friedman et al., 1986). In the present study, species displaying elevated FL values also tended to occupy prominent positions within categories characterized by higher consensus, reinforcing the connection between cultural agreement and therapeutic specificity.

These findings suggest that local medicinal systems contain internal mechanisms capable of filtering and reinforcing particular therapeutic practices over time. Rather than relying exclusively on individual experimentation, communities appear to construct shared frameworks through which medicinal knowledge is collectively evaluated, transmitted, and maintained. Such processes help explain why some species acquire exceptional prominence within local pharmacopoeias and contribute to the long-term stability of traditional healthcare systems.

4.5. Amburana Cearensis as a Biocultural Keystone Species

Among all recorded medicinal plants, *Amburana cearensis* emerged as the species that most clearly combines cultural prominence, therapeutic versatility, and potential conservation relevance. The species exhibited the highest use value, one of the highest fidelity levels, and broad participation across therapeutic categories, including respiratory, digestive, neurological, infectious, cardiovascular, and systemic disorders. Such a pattern suggests that its importance extends beyond simple medicinal utility, occupying a central position within the local healthcare system.

The concept of biocultural keystone species offers a useful framework for interpreting this finding. Species classified within this category are characterized by their disproportionate influence on cultural practices, knowledge systems, and human-environment relationships relative to their numerical abundance. In the communities investigated, *A. cearensis* appears to fulfill this role by functioning as a therapeutic resource repeatedly recognized, transmitted, and validated across generations.

Its cultural prominence is supported by a growing body of pharmacological evidence. Studies have demonstrated that extracts obtained from *A. cearensis* contain phenolic compounds with significant antioxidant and antimicrobial properties, findings that provide scientific support for several traditional therapeutic applications reported by local populations (Aguiar et al., 2017). Recent reviews have further highlighted the species' phytochemical diversity and broad spectrum of biological activities, including anti-inflammatory, antimicrobial, and antioxidant effects (Silveira et al., 2022).

The convergence between traditional knowledge and pharmacological evidence does not necessarily validate all medicinal uses attributed to the species. Nevertheless, it suggests that cultural selection processes may be influenced by repeated observations of therapeutic efficacy accumulated over long periods. Such convergence helps explain why *A. cearensis* occupies a dominant position within local medicinal systems and reinforces its relevance for future ethnopharmacological investigations.

From a conservation standpoint, the prominence of this species deserves particular attention because medicinal use frequently

involves bark extraction. Recurrent harvesting of bark may increase pressure on natural populations, especially in semiarid ecosystems where regeneration can be slow and environmental conditions often limit recovery. Consequently, the species represents a compelling example of the challenges associated with balancing cultural importance, medicinal demand, and biodiversity conservation.

4.6. Croton Conduplicatus And Myracrodruon Urundeuva as Priority Medicinal Resources

The results also identified *Croton conduplicatus* and *Myracrodruon urundeuva* as species of exceptional ethnobotanical relevance. Both taxa exhibited elevated use values, broad therapeutic applicability, and recurrent citations across the investigated communities, indicating their integration into the core structure of local medicinal knowledge.

The importance of *C. conduplicatus* appears closely related to its therapeutic versatility. Informants associated the species with gastrointestinal, respiratory, infectious, neurological, and general health conditions, suggesting a wide spectrum of perceived medicinal benefits. Such perceptions are consistent with pharmacological studies reporting neuropharmacological activity and bioactive compounds capable of influencing different physiological processes (Oliveira Júnior et al., 2018). Although additional clinical evidence remains necessary, these findings indicate that local therapeutic uses may be partially supported by measurable biological properties.

A similar pattern was observed for *M. urundeuva*, one of the most widely recognized medicinal trees in northeastern Brazil. The species

has long been employed in traditional medicine for the treatment of inflammatory conditions, infections, and tissue injuries. Experimental studies have demonstrated anti-inflammatory activity in leaf preparations and have identified compounds with potential therapeutic applications (Aquino et al., 2019). Additional investigations have also reported antiviral activity against rotavirus, expanding the range of biological effects associated with the species (Cecílio et al., 2016).

The prominence of these two species reinforces the interpretation that local medicinal systems are not organized around a random assortment of resources. Instead, cultural importance appears to emerge through repeated processes of selection, validation, and transmission that favor species perceived as reliable and therapeutically effective. Their simultaneous occurrence among the taxa with the highest use values and broadest therapeutic versatility supports the hypothesis that cultural prominence is associated with multifunctionality and recurrent practical utility.

Ecologically, both species deserve attention because their medicinal use frequently involves harvesting practices that may affect plant survival when performed intensively. Consequently, their conservation relevance derives not only from their biological characteristics but also from their central role within local healthcare systems.

4.7. Conservation Implications For Medicinal Plants Of The Caatinga

The findings of this study reveal that medicinal plant conservation in the Caatinga cannot be understood exclusively through ecological

criteria. Cultural importance, therapeutic versatility, and patterns of resource use also influence the degree to which species may experience harvesting pressure and, consequently, require conservation attention. The concentration of medicinal functions within a relatively small group of native species suggests that biodiversity conservation and traditional healthcare systems are closely interconnected.

Previous studies have emphasized that several medicinal species widely used in the Caatinga simultaneously exhibit ecological relevance and high cultural value (Santos et al., 2017). The present investigation reinforces this observation by demonstrating that the most important medicinal resources are predominantly native taxa repeatedly cited across communities and therapeutic categories. Such dependence increases the vulnerability of local healthcare systems to potential declines in the availability of these species.

Landscape transformation constitutes an additional source of concern. Research conducted at broader spatial scales has demonstrated that medicinal species richness and distribution may be influenced by socioeconomic conditions and human modifications of natural environments (Cantalice et al., 2025). In semiarid regions undergoing agricultural expansion, vegetation suppression, and increasing land-use intensity, pressures affecting medicinal plants may become particularly significant.

Conservation strategies focused solely on species protection may therefore prove insufficient. Effective approaches should integrate ecological management with the preservation of traditional ecological knowledge, recognizing local communities as active participants in conservation processes rather than merely users of

natural resources. Such a perspective is particularly relevant in the Caatinga, where medicinal knowledge constitutes an important component of biocultural heritage and contributes directly to local well-being.

The identification of species such as *Amburana cearensis*, *Croton conduplicatus*, and *Myracrodruon urundeuva* as culturally prominent medicinal resources highlights the need for future initiatives involving sustainable harvesting practices, community-based conservation programs, and long-term monitoring of species subjected to recurrent extraction. Integrating cultural and ecological dimensions may represent one of the most promising pathways for safeguarding both biodiversity and traditional healthcare systems in seasonally dry tropical forests (Koch; Almeida-Cortez; Kleinschmit, 2017).

4.8. Study Limitations

Several limitations should be considered when interpreting the results of this study. First, the sample was intentionally composed of local knowledge holders and medicinal plant users rather than a statistically representative sample of the entire population. Although this approach is widely accepted in ethnobotanical research and appropriate for documenting Traditional Ecological Knowledge, it may limit the generalization of findings beyond the investigated communities.

A second limitation relates to the geographical scope of the study. Data were collected in three rural communities located within a single municipality of southeastern Piauí. While this design allowed a detailed examination of local medicinal systems, broader regional

comparisons would be necessary to determine whether the observed patterns are representative of other areas of the Caatinga.

Another important limitation concerns the absence of ecological monitoring data. The study focused on ethnobotanical knowledge and medicinal plant use without directly assessing population structure, regeneration rates, harvesting intensity, or conservation status of the recorded species. Consequently, the conservation implications discussed here should be interpreted as informed hypotheses derived from ethnobotanical evidence rather than direct measures of ecological vulnerability.

Despite these limitations, the study contributes important insights into the organization of local medicinal systems in a poorly documented region of the Brazilian semiarid zone. By integrating cultural importance indicators, therapeutic consensus, and conservation perspectives, the research advances understanding of how traditional ecological knowledge shapes the use and valuation of medicinal biodiversity in the Caatinga and provides a foundation for future interdisciplinary investigations.

Taken together, the findings suggest that medicinal plant use in southeastern Piauí is structured by a dynamic interplay between ecological availability, cultural transmission, perceived therapeutic efficacy, and historical experience. The prominence of a limited group of native species, coupled with high levels of cultural consensus and therapeutic versatility, indicates that local medicinal systems are organized through selective processes that favor the maintenance of culturally validated resources.

Beyond documenting medicinal plant diversity, the study highlights how Traditional Ecological Knowledge contributes to shaping patterns of resource use, cultural resilience, and biocultural conservation within the Caatinga, reinforcing the need for integrative approaches capable of simultaneously addressing human well-being, biodiversity conservation, and the preservation of traditional knowledge systems.

5. CONCLUSION

This study investigated the medicinal plants used by rural communities in southeastern Piauí and examined how Traditional Ecological Knowledge contributes to the selection, valuation, and maintenance of medicinal resources within the Caatinga biome. The findings revealed a rich local pharmacopoeia composed of 61 medicinal species distributed across 36 botanical families, demonstrating the continued relevance of plant-based therapies in community healthcare practices. Although both native and exotic species were incorporated into local medicinal systems, native taxa occupied the most prominent positions in terms of cultural importance, therapeutic versatility, and consensus among informants.

The results support the interpretation that medicinal knowledge is not randomly organized. Instead, local healthcare systems appear to be structured around a relatively small group of culturally prominent species that concentrate multiple therapeutic functions and high levels of community recognition. Species such as *Amburana cearensis*, *Croton conduplicatus*, and *Myracrodruon urundeuva* emerged as central components of the local pharmacopoeia, combining elevated use values, broad therapeutic applicability, and

strong cultural validation. These findings provide empirical support for the proposed hypotheses and suggest that cultural selection processes play a fundamental role in shaping patterns of medicinal plant use.

From a theoretical perspective, the study contributes to ongoing discussions concerning Traditional Ecological Knowledge and biocultural heritage. The documented patterns demonstrate that medicinal plant use involves much more than the exploitation of available biological resources. Knowledge transmission, collective experience, cultural memory, and perceptions of therapeutic efficacy jointly influence the ways in which communities interact with biodiversity. By integrating ethnobotanical indicators with analyses of cultural consensus and therapeutic versatility, the research advances understanding of how local knowledge systems contribute to the maintenance of biocultural relationships in seasonally dry tropical environments.

The conservation implications of these findings are particularly relevant for the Caatinga biome. The concentration of medicinal functions within a limited number of native species indicates that biodiversity conservation and community healthcare systems are closely interconnected. Several of the most culturally important taxa are subject to harvesting practices involving bark, roots, or woody tissues, which may increase pressure on natural populations when associated with frequent use. Conservation strategies should therefore move beyond strictly ecological approaches and incorporate local communities, traditional knowledge, and sustainable resource management as complementary components of biodiversity protection.

Future research should expand the geographical scope of investigation to include other regions of the Caatinga, allowing broader comparisons of medicinal plant use patterns and cultural consensus. Long-term ecological studies evaluating harvesting intensity, regeneration dynamics, and population structure of culturally important species would provide valuable information for conservation planning.

Additional ethnopharmacological investigations may also contribute to understanding the biological mechanisms underlying the therapeutic uses reported by local communities. Integrating ecological, cultural, and pharmacological perspectives will be essential for strengthening the scientific understanding of medicinal plant systems and supporting strategies aimed at conserving both biodiversity and traditional knowledge in the Brazilian semiarid region.

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