Universidade de Brasília
Instituto de Ciências Biológicas
Departamento de Botânica
Programa de Pós-graduação em Botânica

Jurema species and their ritualistic wines: ethnobotanical and phytochemical literature review

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Orientadora: Profª. Drª. Regina Célia de Oliveira

Dissertação apresentada ao Programa de Pós-Graduação em Botânica da Universidade de Brasília, como parte dos requisitos necessários para a obtenção do título de Mestre em Botânica.

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“Não fui eu que escolhi a Jurema,
foi a Jurema que me escolheu”

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SUMMARY

Resumo expandido

Jurema é um termo usado para referir-se às plantas, locais místicos, entidades espirituais e bebidas ritualísticas, como o vinho de Jurema. O termo Jurema foi originalmente utilizado por grupos indígenas em rituais de pajelança, para cura e espiritualidade. O uso da Jurema se expandiu para o meio urbano por grupos afro-indígenas, primeiramente através da religião denominada Catimbó, cujo nome posteriormente foi alterado para a religião agora também chamada Jurema e Jurema Sagrada e o vinho e plantas foram introduzidos em alguns grupos religiosos de Umbanda, Candomblé e de Ayahuasca, em grupos sincréticos de Juremayahusca. Preparado de forma sigilosa, o vinho da Jurema é considerado um enteógeno pela presença do alcaloide indólico N,N-dimetiltriptamina (DMT). Somente aquele que passou batismo sabe como é feito o vinho da Jurema.

Há raras referências quanto ao uso da Jurema, provavelmente pela repressão que sofreu na época colonial, aos indígenas e demais usuários, que consideravam o vinho como bebida“diabólica”. De fato, o primeiro documento que reporta o uso da Jurema é de 1739, resultado de uma reunião da Junta das Missões de Pernambuco em que se discutia como extirpar o uso da Jurema. Autores etnobotânicos do século XIX chegaram a pensar que o ritual com Jurema estaria extinto. Entretanto, com o ressurgimento de um movimento psicodélico, o uso da Jurema vem sendo divulgado. Além da complexidade do termo Jurema, no que se refere à(s) espécie(s) botânicas a que o termo se refere, a maior lista compilada de espécies engloba 19 espécies, das quais 16 pertencem à família Fabaceae e seis ao gênero *Mimosa* L. As espécies de *Mimosa* associada ao culto são *M.* série *Leiocarpae*, cujas espécies possuem uma complexa delimitação. Ao analisarmos a lista de espécies relacionadas à Jurema e citada por inúmeros autores, começamos a perceber a presença de espécies de uso pouco provável. Também nos chamou a atenção a falta de informações a respeito do vinho de Jurema na maioria dos trabalhos.

Assim, o objetivo deste trabalho foi realizar uma revisão bibliográfica crítica, associada à pesquisa em herbários das espécies, especialmente do gênero *Mimosa* - pela maior citação de *M. tenuiflora* e seu sinônimo *M. hostilis* e as demais *M.* seção *Leiocarpae* - que estão relacionadas ao complexo da Jurema, comparando-se os perfis fitoquímicos das espécies relacionadas e do vinho, além de outros usos medicinais, numa análise crítica e organizada para embasar estudos futuros. A revisão foi proposta para responder 5 perguntas principais: 1) quais são as espécies documentadas como componentes do vinho da Jurema e

o número de citações por espécies; 2) discutir a confiabilidade dos registros já que não foram encontrados vouchers de herbário; 3) verificar quais são as partes das plantas utilizadas para a produção do vinho; 4) listar outros usos e atributos dessas espécies; e 5) organizar os dados fitoquímicos disponíveis para as espécies candidatas à composição do vinho da Jurema.

Realizou-se buscas de artigos publicados entre 1940 e 2025 nas bases Google Acadêmico, Pubmed, SciElo, Science Direct, utilizando o operador Booleano 'AND'. Os artigos foram filtrados e os nomes científicos foram revisados pela Flora e Funga do Brasil. Foi feita uma busca no specieslink de vouchers de herbário.

O estudo englobou a análise da evolução temporal de publicação dos artigos através do programa Python. Foram calculadas métricas para caracterizar as publicações em um ano, incluindo o número total de publicações, a média anual e as médias mínimas e máximas, provendo uma tendência de publicações ao longo dos anos. À listagem final de espécies associadas à Jurema foram incluídos outros usos citados nos artigos selecionados e se a espécie citada é nativa, cultivada ou introduzida. Tabelas adicionais provendo os componentes fitoquímicos publicados foram adicionadas. As doenças em que as Juremas são utilizadas foram padronizadas conforme a Classificação Internacional Primária de Doenças (ICPC-3). Foi calculado o Grau de Consenso entre os usos das espécies e a frequência de citação de cada.

Foram selecionados 66 artigos. A média anual de publicações foi de 1.89, indicando um nível relativamente estável de artigos ao longo do tempo. Foram selecionados 66 artigos. A média anual de publicações foi de 1.89, indicando um nível relativamente estável de artigos ao longo do tempo. A lista compilada na literatura é de 33 espécies, e seis espécies foram encontradas em Reflora, totalizando 39 espécies que fazem parte do Complexo Jurema. Algumas espécies de Jurema não foi compiladas na lista do Albuquerque (1997, 2002), incluindo: *Vachellia farnesiana* (L.) Wight & Arn. (listada como *Acacia farnesiana*), *Mimosa scabrella* Benth., *Mimosa burgonia* Aubl., *Chloroleucon acacioides* (Ducke) Barneby & J.W. Grimes (listada como *Pithecellobium acacioides* Ducke), *Chloroleucon mangense* var. mathewsii (Benth.) Barneby & J.W.Grimes, *Chloroleucon tenuiflorum* (Benth.) Barneby & J.W.Grimes, *Mimosa simonii* PG. Ribeiro & L.P. Queiroz, *Mimosa setosa* Benth., *Mimosa insignis* (Hassl.) Barneby, *Mimosa gemmulata* Barneby. A lista do Albuquerque mostra 19 espécies que fazem parte do complexo da Jurema, a lista composta neste trabalho mostra um número muito superior à lista mais divulgada. *Mimosa tenuiflora* é a espécie mais citada na preparação do vinho, com valor de consenso de 81,8, sendo seguida por *M. verrucosa*, com

27,27, sendo seguida por *Peganum harmala* e *Vitex agnus-castus* com 15,15 cada e *M. ophtalmocentra*, com 10,6. As demais espécies ficaram com consenso inferior a 10.

Mimosa tenuiflora é a espécie com maior detalhamento de estudos fitoquímicos. As demais espécies citadas de *Mimosa* possuem raras informações sobre seus compostos. A presença de DMT está registrada para *M. tenuiflora*, *M. ophthalmocentra e M. verrucosa*. Embora haja referências na literatura sobre o uso preferencial de *M. tenuiflora* sem espinhos para a produção do vinho da Jurema, não há investigações fitoquímicas a esse respeito. Dentre a lista de espécies citadas, *Peganum harmala* é exótica e não citada para o Brasil na Flora e Funga do Brasil e todo material disponível no specieslink é proveniente de coletas no exterior, mas o uso na Jurema foi citado por 10 autores. Talvez o ingrediente seja obtido por importação. O uso de *Lippia chamissonis* registrado por um autor e sem registro em herbários relacionando-a à Jurema, deixa dúvidas quanto à identificação por se tratar de espécie rara e sem registro no Nordeste. Ademais, não está claro na literatura se as espécies de Jurema são usadas na produção do vinho ou nos rituais.

Não há registro de material em herbário de nenhum dos artigos consultados e, ao contrário do que é mostrado na literatura para vários grupos e espécies de importância etnobotânica, os herbários não foram fonte de informações com coletas adicionais. Além da escassez de estudos fitoquímicos das espécies citadas e pouco registro do modo de preparo do vinho, não há estudos disponíveis sobre a fitoquímica do vinho de Jurema na literatura. Este estudo reúne, de forma inédita e crítica, as informações disponíveis sobre as espécies associadas ao ritual da Jurema, com destaque para *Mimosa tenuiflora* como principal componente do vinho. A revisão revelou a diversidade de plantas envolvidas, a escassez de estudos fitoquímicos e a ausência de registros em herbários, apontando a necessidade de pesquisas mais aprofundadas e documentadas. Ao valorizar o conhecimento tradicional e promover o diálogo com a ciência, o trabalho contribui para a preservação e compreensão desse importante patrimônio cultural afro-indígena.

Palavras-chaves: compostos químicos; plantas enteógenas; DMT; *Mimosa*.

Resumo

Introdução: O Complexo da Jurema refere-se a um conjunto de elementos que inclui plantas, locais místicos, entidades espirituais e bebidas ritualísticas, como o vinho de Jurema. Inicialmente empregado por grupos étnicos em rituais de cura e espiritualidade, o uso da Jurema expandiu-se para o contexto urbano, integrando práticas como o Catimbó e a Jurema Sagrada. Preparado de forma sigilosa, o vinho da Jurema é considerado um enteógeno pela presença do alcaloide indólico N,N-dimetiltriptamina (DMT). A expansão do uso da Jurema se deu por grupos afro-indígenas, primeiramente através do Catimbó, a criação de uma religião chamada Jurema Sagrada, introduzido na Umbanda e em rituais de Ayahuasca, em grupos sincréticos de Juramayahusca. Há raras referências históricas quanto ao uso da Jurema, provavelmente pela repressão dos Jesuítas ao culto e autores do século XIX chegaram a dizer que o ritual com Jurema estaria extinto. Entretanto, com o ressurgimento de um movimento psicodélico, o uso da Jurema vem sendo divulgado. A maior lista compilada de espécies associadas à Jurema engloba 19 espécies, das quais 16 pertencem à família Fabaceae e seis ao gênero *Mimosa* L. A diversidade taxonômica dessas espécies levanta questionamentos sobre sua correta identificação e uso. **Objetivo:** realizar uma revisão bibliográfica integrada à pesquisa em herbários das espécies, especialmente do gênero *Mimosa* - pela maior citação de *M. tenuiflora* e a dificuldade de distinção entre as espécies da série *Leiocarpa* - que estão relacionadas ao complexo da Jurema, comparando-se os perfis fitoquímicos e outros usos medicinais, numa análise crítica e organizada para embasar estudos futuros. **Metodologia:** realizou-se buscas de artigos publicados entre 1940 e 2025 nas bases Google Acadêmico, Pubmed, SciElo, Science Direct, utilizando o operador Booleano 'AND'. Os artigos foram filtrados e os nomes científicos foram revisados. Foi feita uma busca no specieslink de vouchers de herbário e também foi realizada uma pesquisa no Reflora. **Resultados:** foram selecionados 66 artigos. Após compilar os artigos mostra-se que *Mimosa tenuiflora* a espécie mais citada na preparação do vinho e a que possui maior detalhamento fitoquímico. As demais espécies citadas de *Mimosa* carecem de informações sobre seus compostos, mas a presença de DMT está registrada para *Mimosa tenuiflora*, *M. ophthalmocentra e M. verrucosa*. Além disso, 10 espécies não listadas previamente foram identificadas como Jurema, ampliando o número de espécies conhecidas por esse nome

popular. Dentre a lista de espécies citadas, *Peganum harmala* é exótica e o uso de *Lippia chamissonis*, sem registro em herbários, deixa dúvidas quanto à identificação por se tratar de espécie rara e sem registro no Nordeste. Além da escassez de estudos fitoquímicos das espécies citadas e pouco registro do modo de preparo do vinho, não há estudos disponíveis sobre a fitoquímica do vinho de Jurema na literatura. **Conclusão:** A listagem das espécies de Jurema contribuiu para o conhecimento das práticas, das espécies usadas e o uso do vinho de Jurema. Contudo, a revisão evidencia a importância de pesquisas futuras mais aprofundadas sobre a diversidade e a composição química dessas plantas e vinhos.

Palavras-chaves: compostos químicos; plantas enteógenas; DMT; *Mimosa*.

Abstract

Introduction: The Jurema Complex refers to a set of elements that includes plants, mystical places, spiritual entities, and ritualistic beverages, such as Jurema wine. Initially used by ethnic groups in healing and spiritual rituals, the use of Jurema has expanded into the urban context, integrating practices such as Catimbó and Sacred Jurema. Prepared in secret, Jurema wine is considered an entheogen due to the presence of the indole alkaloid N,N-dimethyltryptamine (DMT). The expansion of Jurema's use was driven by Afro-indigenous groups, first through Catimbó, the creation of a religion called Sacred Jurema, introduced into Umbanda and Ayahuasca rituals, in syncretic groups of Juramayahusca. There are rare historical references to the use of Jurema, probably due to the repression of the cult by the Jesuits, and 19th-century authors even claimed that the Jurema ritual had become extinct. However, with the resurgence of a psychedelic movement, the use of Jurema has been publicized. The largest compiled list of species associated with Jurema encompasses 19 species, of which 16 belong to the Fabaceae family and six to the *Mimosa* L. genus. The taxonomic diversity of these species raises questions about their correct identification and use. **Objective:** to conduct a bibliographic review integrated with research in herbariums of the species, especially of the genus *Mimosa* - due to the greater citation of *M. tenuiflora* and the difficulty of distinguishing between the species of the *Leiocarpa* series - which are related to the Jurema complex, comparing phytochemical profiles and other medicinal uses in a critical and organized analysis to support future studies. **Methodology:** searches were conducted for articles published between 1940 and 2025 in the Google Scholar, Pubmed, SciElo, and Science Direct databases, using the Boolean operator 'AND'. The articles were filtered and the scientific names were reviewed. A search was conducted in specieslink for herbarium vouchers and a search was also conducted in Reflora. **Results:** 66 articles were selected. After compiling the articles, it was found that *Mimosa tenuiflora* is the most cited species in the preparation of wine and the one with the most detailed phytochemical information. The other *Mimosa* species cited lack information about their compounds, but the presence of DMT is recorded for *Mimosa tenuiflora*, *M. ophthalmocentra*, and *M. verrucosa*. In addition, 10 species not previously listed were identified as Jurema, expanding the number of species known by this popular name. Among the list of species mentioned, *Peganum harmala* is exotic, and the use of *Lippia chamissonis*,

which is not recorded in herbariums, raises doubts as to its identification, as it is a rare species with no record in the Northeast. In addition to the scarcity of phytochemical studies of the species cited and few records of how the wine is prepared, there are no studies available on the phytochemistry of Jurema wine in the literature. **Conclusion:** The list of Jurema species contributed to the knowledge of the practices, species used, and use of Jurema wine. However, the review highlights the importance of further in-depth research on the diversity and chemical composition of these plants and wines.

Keywords: chemical compounds; Entheogenic plants; DMT, *Mimosa*.

1.Introduction

Various terms have been used to describe substances that induce alterations in the human mind, such as psychotropic, hallucinogenic, psychomimetic, schizogenic, eidetic, psychotic, psychogenic, and psychodysleptic, among others (Turner and Efrat, 1982). The use of the term “entheogen” has been preferred out of respect for religious groups, since the other terms have acquired pejorative connotations. An entheogen is defined as “any substance which, when ingested, catalyzes or generates an altered state of consciousness with spiritual significance” (Hoffman and Ruck, 2004). In addition to theological implications, “enheogen” also carries a distinctly Gnostic or deistic connotation, implying a direct and unmediated experience of the divine (Segal and Stuckrad, 2015). Entheogenic plants have a rich history of study and therapeutic applications in various human cultures over many centuries.

The Jurema Complex (Mota and Barros, 2006) is a set of practices that encompasses rituals, mystical places, entities, and botanical species associated with various ethnic groups of northeastern Brazil, such as the Pankararé, Kariri-Xocó, Xucuru, among others, later adopted and reinterpreted in Afro-Brazilian cults. Although Jurema is used in religious ceremonies, it is still not possible to determine precisely when the cult of Jurema Nativa came into contact with Afro-Brazilian possession cults. Some scholars suggest that this encounter may have occurred in the 18th century, a period when Candomblé was already widespread in areas of the interior of the Northeast. (Nascimento, 1997). Therefore, it is likely that knowledge about Jurema was passed on to enslaved Africans who, in their flight to the quilombos, found refuge among indigenous tribes in northeastern Brazil, where a visionary drink was consumed (Assunção, 2014). When they left these communities, they took this knowledge with them, which was later passed on and reinterpreted in other contexts, such as in the rituals of Afro-Brazilian religions. Plants known as ‘Jurema’ can be found in the form of snuff, incense, tobacco, used in mediumistic baths, and also in beverages such as wine or tea (Mota and Barros, 2006).

The drink prepared in rituals using Jurema plants is mainly known as “Jurema Wine.” There is considerable variation in the way it is prepared among indigenous peoples and Afro-Brazilian cults, as the ritual is a secret to these groups and little information is available (Albuquerque, 2002). A brief description by Lima (1946) of how Jurema wine is made by a Pancararú group: the roots are scraped to remove the soil and macerated until they form a

paste, which is placed in a container with water, turning it into a red, foamy syrup. The foam is removed and the drink is consumed.

Although most authors relate Jurema wine to *Mimosa tenuiflora* (Willd) Poiret, the Kariri people of the state of Alagoas report that their ancestors used spiny Jurema plants (*Mimosa tenuiflora*) to prepare the wine but currently prefer to use the 'mansa' Jurema (*M. verrucosa* Benth), a species without thorns, since the spiny one is considered 'dangerous'. According to the Kariri shaman, the purpose of the Jurema mansa is to provide 'visions of a dream world' without inducing the person into an altered state of consciousness, thus avoiding the 'madness' effect associated with the wine prepared from the spiny Jurema (Silva et al., 2010). According to a Xukuru group, the Jurema drink facilitates a deeper connection between the Indigenous people and the 'encantados', who are the spirits of the ancestors (Silva and Andrade, 2002).

Grünewald (2008) points out that Jurema wine is made from the bark of the root or stem of the plant, which is usually thornless Black Jurema (in this case, the author seems to refer to unarmed forms of M. tenuiflora and not M. verrucosa as Silva et al. (2010). The description of wine production is the same as that given by Lima (1946). The plant is harvested in the forest, crushed or macerated with stones, rubbed with the hands in cold water, and left to rest. Then, the bagasse is removed and the drink is consecrated, most often with pipe smoke. It is with this drink that the indigenous people come into contact with the enchanted and other invisible beings. There is also the "cure," which is Jurema mixed with garlic and cachaça. The drink is placed on the fire to evaporate the alcohol, but the flavor remains. Honey is also very important in these rituals, serving as food for the caboclos, Canindé, who are indigenous peoples of Aratuba-CE (Xavier and Vasconcelos, 2018), and other beings of the forest. Just as Jurema should not have thorns, the honey used in rituals should also, by homology, come from stingless bees.

There is no information on the pre-colonial use of Jurema by indigenous peoples (Grünewald and Salvodi, 2020), and Souza et al. (2008) highlighted the rarity of studies on Jurema in the context of Afro-indigenous religions. Silva et al. (2010) comment that, in the Afro-indigenous Jurema cults of Recife, each Juremeiro master has a preference and method for preparing the tea. According to these authors, white Jurema wine (*Pithecellobium foliolosum* Benth) is milder than black Jurema wine (*M. tenuiflora*) and is preferred by many Juremeiros. Camargo (2014) and Martínez et al. (2009) emphasize that the use of Jurema in Afro-indigenous places of worship brings about changes in the composition and method of preparation of the drink.

Albuquerque (1997, 2002) compiled from the literature a list of 19 species related to the Jurema complex. These species are commonly referred to by binomials such as: Black Jurema, White Jurema, Red Jurema, Pink Jurema, Small Jurema, Jurema, and Little Jurema (Jureminha) (Albuquerque, 2002). Of this total, 16 species belong to the Fabaceae family, six of which are from the genus *Mimosa* L.: *M. tenuiflora*, *M. verrucosa*, *M. ophthalmocentra* Mart. ex Benth., *M. acutistipula* Benth., *M. arenosa* (Willd) Poir., and *M. adenophylla* Taub. var. *mitis* Barneby.

Mimosa tenuiflora is the species most frequently cited for use in wine preparation (Rodrigues, 2018). The *Mimosa* taxa cited by Albuquerque (1997, 2002) are related to *M. ser. Leiocarpae* sensu lato, which has species that are difficult to circumscribe (Santos-Silva et al., 2015). *Mimosa tenuiflora* occurs in regions characterized by periodic droughts, distributed in Brazil, Colombia, El Salvador, Honduras, Mexico, Nicaragua, Panama, and Venezuela. In Brazil, it occurs throughout the Northeast region and in Minas Gerais (Flora and Funga of Brazil, 2025). It is a shrub or small tree four to seven meters high. The stem has thorns or is rarely unarmed, straight or slightly curved, the bark is brown, rough, and peels off the trunk. The young leaves are typically viscous, i.e., sticky due to the presence of tiny glands, which aids in field identification (Costa et al., 2002). They are bipinnate, with five to seven pairs of pinnae and 18 to 36 pairs of leaflets per pinna. The leaflets are shiny and glabrous. The inflorescence is spike-shaped and the flowers are white to cream-colored. The fruit is of the crassiped type, the seeds are ovoid and brown in color (Costa et al., 2002). Identification can be made by the 4-angled calyx and the inflorescences that develop simultaneously with the spikes in full bloom (Flora e Funga, 2025). The morphology of the fruits also aids in identification, due to the inflated articles in the seed region (Flora e Funga, 2025). This species is widely used in agroforestry management (Souza et al., 2008).

In the 1940s, Oswaldo Lima analyzed Jurema and found alkaloids, which he initially identified as ‘Nigerina’ (apud Silva et al., 2010). Pachter et al. (1959) received Jurema roots from Oswaldo Lima himself and reported that the alkaloid known as ‘Nigerina’, responsible for the entheogenic effect, is N,N-dimethyltryptamine (DMT). The effects of DMT are similar to those of LSD-25, but with a faster onset and shorter duration (Souza et al., 2008). DMT is also found in other ritualistic beverages of Indigenous peoples, such as Ayahuasca, and in various species from different plant families (Stafford, 1992; Rätsch, 2005; Barker et al, 2012).

Ayahuasca tea is made from two species: *Banisteriopsis caapi* (Spruce ex Griseb.) C.V. Morton and *Psychotria viridis* Ruiz & Pavon. The effects of the tea generally appear 15

to 30 minutes after ingestion, reach peak intensity at around 90 minutes, and last for 2 to 6 hours, depending on the dose. It can be ingested more than once during a ritual (Kaasik et al., 2021).

Although there is scarce academic documentation on its preparation methods, the use of teas that include *Mimosa tenuiflora* as a substitute for *Psychotria viridis* has been documented in Europe (Kaasik et al., 2021). This species of Jurema is also gaining popularity among Neo-Shamanic groups worldwide. This has led to the formation of new religious movements, such as Umbandaime, where Ayahuasca or Jurema wine are consumed interchangeably (Gaujac et al., 2013). Ayahuasca and Jurema, although they originated in geographically distinct contexts, converged at a certain point and began to coexist, contributing to the emergence of a postmodern Jurema, known as Juremahuasca (Labate, 2004).

Knowledge of the chemical constituents of the species known as Jurema and of the wine itself will support the safe use of the drink in rituals (Finêncio & Mininel, 2019). A deeper understanding of the chemical constituents in different plant organs and species can promote sustainable use, help determine a good management plan for extraction, and play a crucial role in conservation (Finêncio & Mininel, 2019).

When compiling the bibliography on the components of Jurema wine, we began to notice discrepancies between what we observed in Jurema houses in the region and the lists of species provided by the review studies (Albuquerque 1997, 2002; Souza et al. 2008). Among the discrepancies, the list of Jurema species provided (Albuquerque 1997, 2002; Souza et al. 2008) not only fails to include all the taxa observed in the field, but also cites taxa that, because they are rare and do not occur in the Northeast, led us to question their use. The objective of this study was to conduct an integrated review of the species, especially of the genus *Mimosa* - due to the greater citation of *M. tenuiflora* and the difficulty of distinguishing between the species of the Leiocarpa series - which are related to the Jurema complex, comparing their phytochemical profiles and promoting a critical and organized analysis to support future studies. The academic text review was proposed to answer five main questions: 1) what are the documented species for the composition of the Jurema drink and the number of citations per species; 2) discuss the reliability of these records since there are no herbarium vouchers for some taxa; 3) Verify the parts of the plants used; 4) List other popular uses attributed to them; and 5) Organize the available phytochemical data on the species that are candidates for use in the composition of the Jurema drink.

2. Materials and Methods

2.1. Literature review

We limited the literature review to scientific articles that address the Mimosa species most frequently used in the preparation of Jurema wine, published between 1940 and 2025. In the process of selecting the articles, four databases were consulted: Google Acadêmico, Pubmed, SciElo, Science Direct, using the operator Booleano 'AND'. The following terms were used in the search: *Mimosa tenuiflora* AND jurema preta, *Mimosa tenuiflora* AND vinho de jurema, *Mimosa tenuiflora* AND wine jurema, *Mimosa tenuiflora* AND composição química, *Mimosa tenuiflora* AND fitoquímica, *Mimosa tenuiflora* AND jurema branca, *Mimosa tenuiflora* AND Black jurema, *Mimosa tenuiflora* AND white jurema, *Mimosa tenuiflora* AND phytochemistry, *Mimosa acutistipula* AND jurema preta, *Mimosa acutistipula* AND vinho de jurema, *Mimosa acutistipula* AND wine jurema, *Mimosa acutistipula* AND composição química, *Mimosa acutistipula* AND fitoquímica, *Mimosa acutistipula* AND jurema branca, *Mimosa acutistipula* AND Black jurema, *Mimosa acutistipula* AND white jurema, *Mimosa acutistipula* AND phytochemistry, *Mimosa acutistipula* AND chemical composition, *Mimosa arenosa* AND jurema preta, *Mimosa arenosa* AND vinho de jurema, *Mimosa arenosa* AND wine jurema, *Mimosa arenosa* AND composição quimica, *Mimosa arenosa* AND fitoquimica, *Mimosa arenosa* AND jurema branca, *Mimosa arenosa* AND Black jurema, *Mimosa arenosa* AND withe jurema, *Mimosa arenosa* AND phytochemistry, *Mimosa arenosa* AND chemical composition, *Mimosa ophthalmocentra* AND jurema preta, *Mimosa ophthalmocentra* AND vinho de jurema, *Mimosa ophthalmocentra* AND wine jurema, *Mimosa ophthalmocentra* AND composição quimica, *Mimosa ophthalmocentra* AND fitoquimica, *Mimosa ophthalmocentra* AND jurema branca, *Mimosa ophthalmocentra* AND Black jurema, *Mimosa Ophthalmocentra* AND withe jurema, *Mimosa ophthalmocentra* AND phytochemistry, *Mimosa ophthalmocentra* AND chemical composition, M*imosa adenophylla* AND jurema preta, *Mimosa adenophylla* AND vinho de jurema, *Mimosa adenophylla* AND wine jurema, *Mimosa adenophylla* AND composição química, *Mimosa adenophylla* AND fitoquímica, *Mimosa adenophylla* AND jurema branca, *Mimosa adenophylla* AND Black jurema, *Mimosa adenophylla* AND white jurema, *Mimosa adenophylla* AND phytochemistry, *Mimosa adenophylla* AND chemical composition, M*imosa pteridifolia* AND jurema preta, *Mimosa pteridifolia* AND vinho de

jurema, *Mimosa pteridifolia* AND wine jurema, *Mimosa pteridifolia* AND composição química, *Mimosa pteridifolia* AND fitoquímica, *Mimosa pteridifolia* AND jurema branca, *Mimosa pteridifolia* AND Black jurema, *Mimosa pteridifolia* AND white jurema, *Mimosa pteridifolia* AND phytochemistry, *Mimosa pteridifolia* AND chemical composition. In addition, a search was conducted in Flora and Funga do Brasil (Reflora) was conducted using the terms Jurema, Jurema-cor-de-rosa, Jurema-de-caboclo, Jurema-de-espinho, Jurema-de-imbirra, Jurema-preta, Jurema-branca, and Jurema-vermelha in the popular names filter in order to verify the species registered with these names.

2.2. Selection Criteria

The data underwent peer review, following the inclusion criteria stipulated in Table 1. In addition, records found through alternative search methods, such as searching citations in selected articles, were incorporated and analyzed according to the established inclusion criteria.

Table 1 - Inclusion and exclusion criteria parameters used in this literature review

Parameters	Inclusion Criteria	Exclusion Criteria
Language	English and Portuguese	Other languages
Types of Studies	Studies citing the scientific name(s) and species used in the preparation of Jurema wine; Phytochemical analyses and chemical compounds of Jurema wine; Herbarium voucher; Reflora species	Studies that do not cite the scientific name of the species used, which do not show the phytochemistry and chemical compounds
Types of publications	Original articles; Books; website	Editorial letters, conference articles; abstracts; symposiums
Evaluation of chemical compounds and phytochemistry	All studies showing the chemical compounds of Jurema wine included	There was no criteria

Studies identifying the species used in the preparation of Jurema wine were included, as well as those popularly known as Jurema, considering both the species mentioned in the articles and those registered on the Reflora website. Duplicate articles in different databases were excluded using Microsoft Excel software. In addition, all selected articles underwent a manual review to ensure that they met the established inclusion criteria. It is important to note that, throughout the text, the review sought to include the results and conclusions of the original authors on the chemical and phytochemical compounds of the *Mimosa* species that are used in the preparation of Jurema wine and are popularly known as Jurema.

2.3. Data organization, disease categorization, consensus analysis, and importance of species and references

Detailed information from all selected articles was examined and included, from which variables such as study title, species used in the ritual and in the production of Jurema wine, chemical composition of the species and wine, and species known as Jurema were extracted. The information collected on the species used in the preparation of Jurema wine, including the parts of the plant used in the composition of the drink, was placed in tables throughout the text. The scientific names were checked by Flora e Funga do Brasil (2025) and Powo (2025).

For phytochemical studies, the information collected includes all compounds found in the species used in the preparation of Jurema wine, as well as works that included taxa cited under the vernacular name “Jurema.” The selected references were numbered in ascending order in the table available in Appendix 1, in order to facilitate organization and consultation.

The diseases for which Juremas are used as medicine were categorized according to the International Classification of Primary Care (ICPC-3) (https://browser.icpc-3.info/). To assess the degree of consensus among authors regarding the species cited, the frequency of citation of each species was estimated. This index was obtained by calculating the percentage of authors who mentioned a given species in relation to the total number of works analyzed, using the formula: number of authors who cited the species × 100) / total number of publications.

2.4. Analysis of the temporal evolution of publications

This study employed a computational approach to analyze the temporal evolution of the number of academic publications in a specific domain. The methodology was structured into four main stages: data collection and validation, descriptive statistical analysis, trend modeling via linear regression, and result visualization. The implementation was performed using Python 3.6+ as the programming language, leveraging the NumPy library for efficient numerical computations, scikit-learn for building and training the linear regression model, and Matplotlib for creating informative and customizable visualizations, and the code is available at https://github.com/DeborahBambil/TrendScape.

Data were collected from Google Scholar, PubMed, SciELO, and ScienceDirect, and after filtering duplicates, the number of articles published annually was structured into a text file (.txt) with two columns: publication year and number of publications per year. A preprocessing step was performed to ensure data integrity, which included format validation and error filtering. This rigorous approach enabled the accurate analysis of publication trends over time.

Fundamental metrics were calculated to characterize the distribution of publications over the years, including the total number of publications, annual average, and maximum and minimum annual values. The annual average was calculated as the ratio of the total number of publications to the number of years analyzed, using the equation $\bar{Y} = (1/n) * \sum(i=1 \text{ to } n) Yi$, where Yi represents the number of publications in year i, and n is the total number of valid years. This calculation provides a comprehensive understanding of the publication trend over time.

A simple linear regression model was applied to identify patterns of growth or decline in the number of publications over the years. The linear relationship between the year (X) and the number of publications (Y) was modeled using the equation $Y = \beta0 + \beta1X + \epsilon$. The parameters β0 (intercept) and β1 (slope coefficient) were estimated using the ordinary least squares (OLS) method. The coefficient β1 represents the average rate of change in the number of publications per year, while β0 represents the theoretical value of publications when $X = 0$. This model provides a quantitative assessment of the trend in publication output over time.

The findings were visualized through a temporal line graph, showcasing the observed data points and the fitted trend line derived from the linear regression model, thereby facilitating a clear and intuitive understanding of the publication trend over time.

2.5. Herbarium voucher search

Searches were conducted in herbariums for common and scientific names in the SpeciesLink database, as there is evidence that herbariums are an important source of data in ethnobotanical research (Souza & Hawkins, 2017; Million et al. 2020).

2.6. Visits to Jurema houses

With the aim of conducting an ethnobotanical study on the species associated with the Jurema Complex and understanding the uses of these plants, informal visits were made to two religious centers: one located in Brasília, Federal District, and the other in Goiás, where Jurema is used in ritualistic practices. The visits were guided by Pai de Santo from the centers themselves, allowing for the observation of species cultivated in the terreiros and used in ritual practices. These houses were identified using the snowball sampling technique (Vinuto, 2014). Although this approach has been criticized (Espinosa et al., 2012), it is a valuable tool and, in certain contexts, may be the only viable alternative for addressing "sensitive" issues (Bernard, 2017), such as visiting groups that incorporate entheogenic plants into their ritualistic practices (Oliveira et al., 2023).

3. Results

3.1. Selected articles and analysis of the evolution of publications

The analysis of the temporal evolution of academic publications in the specific domain yielded the following results. Over the course of the study period, a total of 66 publications were identified. The average annual publication rate was 1.89, indicating a relatively stable level of scientific output over time (Figure 1).

Notwithstanding this stability, a notable variation in publication numbers was observed between individual years, with a peak of 7 publications in one year and of 0

publications in another. These findings imply that while interest in the field persists, the publication output is subject to fluctuations, with certain years exhibiting more pronounced activity than others.

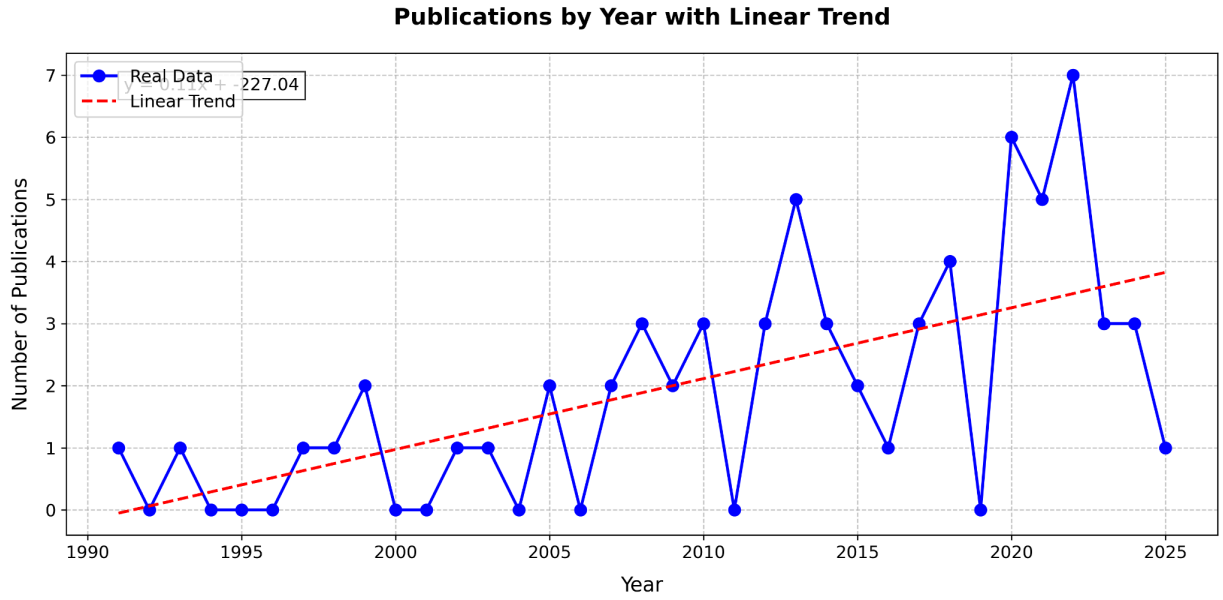

Figure 1. Trend Analysis of Academic Publications Over Time

3.2. Jurema species mentioned, wine additives, and parts used and uses

Table 2 presents the list of species popularly called Jurema and the species used in rituals, together with the respective number of articles and the website where some were found. A total of 33 species were identified in the literature and six species were found in Reflora, totaling 39 species that are part of the Jurema Complex. Some species popularly known as Jurema were not included in the list provided by Albuquerque (1997, 2002), including: *Vachellia farnesiana* (L.) Wight & Arn. (listed as *Acacia farnesiana*), *Mimosa scabrella* Benth., *Mimosa burgonia* Aubl., *Chloroleucon acacioides* (Ducke) Barneby & J.W. Grimes (listed as *Pithecellobium acacioides* Ducke), *Chloroleucon mangense* var. mathewsii (Benth.) Barneby & J.W.Grimes, *Chloroleucon tenuiflorum* (Benth.) Barneby & J.W.Grimes, *Mimosa simonii* P.G. Ribeiro & L.P. Queiroz, *Mimosa setosa* Benth., *Mimosa insignis* (Hassl.) Barneby, *Mimosa gemmulata* Barneby.

Table 2 - Species (and synonyms) cited in the 66 articles analyzed of species known as Jurema, species used in the preparation of Jurema wine, species used as additives in Jurema wine, number of citations per species, part of the plant used, uses other than religious, and references used, which are listed in Appendix 1. In bold, species cited by Albuquerque (1997 and 2002) as Jurema; (-) It was not mentioned which part was used, what its use was, or the ICPC code. (Wine) Jurema wine. (*) Species cultivated in Brazil. (*) Naturalized Species. (*) Species not recorded in Brazil. (*) Species not cited by Albuquerque (1997 and 2002).

Family/Species (synonyms)	Popular name	Quotes	Consensus	Part used	How to use	ICPC category	References
Fabaceae							
***Mimosa tenuiflora* (*Acácia jurema*, *Mimosa hostilis*, and *Mimosa nigra*)**	Jurema-Preta	54	81,8	Bark and root	Wine, mediumistic baths, infections, ulcers, wounds, inflammation of internal and external organs, burns, skin problems, menstrual cramps, toothache, headaches, fever, respiratory diseases, hypertension, bronchitis, cough	Digestive system, Immune system, Genital system, musculoskeletal, nervous system, respiratory system	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22 , 23, 24, 25, 26, 27, 30, 31, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 66
Mimosa verrucosa	Jurema Branca ou Jurema Mansa	18	27,27	Bark and root	Wine, nervousness, asthma,	Nervous system, respiratory	2, 6, 7, 8, 9, 12, 15, 21, 22, 23, 43, 45, 46, 49, 53, 54, 62, 66

Family/Species (synonyms)	Popular name	Quotes	Consensus	Part used	How to use	ICPC category	References
					bronchitis, fever, uterine inflammation, ovarian inflammation, gastritis, ulcers	system, immune system, genital system, digestive system	
***Mimosa ophthalmocentra* Mart. ex Benth**	Jurema, Jurema-Vermelha, Jurema-mirim	7	10,60	Root	Wine	-	6, 14, 15, 24, 43, 49, 62
***Mimosa pteridifolia* Benth. (*Mimosa adenophylla* Taub.)**	Jurema Roxa	1	1,5	Bark	Wound treatment, inflammations, tooth extraction, uterine and ovarian inflammations, relieve period symptoms	Immune system, genital system	22
**Mimosa scabrella*	Jurema, Bracatinga	5	7,57	Bark	Against the herpes virus, digestive stimulant and respiratory problem	Immune system, genital system, respiratory system	12, 15, 21, 22, 43

Family/Species (synonyms)	Popular name	Quotes	Consensus	Part used	How to use	ICPC category	References
***Mimosa acutistipula* (Mart.) Benth.**	Jurema, Jureminha	1	1,5	-	Treating alopecia, pharyngitis, inflammatory processes, and limitations	Immune system, respiratory system, digestive system, musculoskeletal, central nervous system	36
***Mimosa arenosa* (Willd.) Poir.**	Jurema, Jurema Branca	1	1,5	-	Expectorant, antitussive, antirheumatic, respiratory diseases	Respiratory system	49
**Mimosa burgonia*	Jurema Marginada	1	1,5	-	Wine	-	66
**Mimosa gemmulata*	Jurema-cor-de-rosa	1	1,5	-	-	-	Reflora
**Mimosa insignis*	Jurema-branca	1	1,5	-	-	-	Reflora

Family/Species (synonyms)	Popular name	Quotes	Consensus	Part used	How to use	ICPC category	References
**Mimosa setosa*	Jurema-branca	1	1,5	-	-	-	Reflora
**Mimosa simonii*	Jurema-preta	1	1,5	-	-	-	Reflora
***Chloroleucon tortum* (Benth.) Barneby & J.A.Grimes (*Pithecellobium tortum*)**	Tataré, Jacaré, Piteco, Jurema	4	6,06	Root	Wine	-	12, 51, 48, 66
***Chloroleucon foliolosum* (Benth.) G.P.Lewis (*Pithecellobium foliolosum* Benth.)**	Jurema Branca	1	1,5	-	Wine	-	2
**Chloroleucon acacioides* (*Pithecellobium acacioides*)	Jurema Branca	1	1,5	-	Wine	-	66
***Chloroleucon dumosum* (Benth.) G.P.Lewis (*Pithecolobium dumosum* Benth.)**	Jurema Branca	1	1,5	-	Wine	-	66

Family/Species (synonyms)	Popular name	Quotes	Consensus	Part used	How to use	ICPC category	References
**Chloroleucon tenuiflorum*	Jurema, Jurema-branca	1	1,5	-	-	-	Reflora
**Chloroleucon mangense*	Jurema	1	1,5	-	-	-	Reflora
***Parapiptadenia* sp.**	Jurema, Jurema Branca	1	1,5	-	-	-	14
***Piptadenia retusa* (Jacq.) P.G.Ribeiro, Seigler & Ebinger (*Piptadenia stipulacea* (Benth.) Duque)**	Jurema Branca	4	6,06	-	Wine and medical purposes	-	4, 57, 59, 62
***Pithecellobium diversifolium* Benth**	Jurema Branca	1	3,03	-	Wine	-	14, 66
***Pityrocarpa moniliformis* (Benth.) Luckow & R.W.Jobson *(Piptadenia moniliformis* Benth.)**	Jurema, Jurema Branca	1	1,5	-	-	-	14

Family/Species (synonyms)	Popular name	Quotes	Consensus	Part used	How to use	ICPC category	References
***Senegalia bahiensis* (Benth.) Bocage & L.P.Queiroz (*Acacia bahiensis* Benth.)**	Jurema, Jurema Branca	1	1,5	-	-	-	14
Senegalia piauhiensis* (Benth.) Bocage & L.P.Queiroz *(Acacia piauhiensis* Benth*)	Jurema Branca	1	3,03	-	Wine	-	14, 66
***Senegalia riparia* (Kunth) Britton & Rose (*Acacia riparia* Kunth)**	Jurema, Jurema Branca	1	1,5	-	-	-	14
Anadenanthera colubrina (Vell.) Brenan	Angico de Caroço	3	4,54	-	Wine additive	-	19, 30, 65
**Vachellia farnesiana* (L.) Wight & Arn. (*Acacia farnesiana* (L.) Willd.)	Jurema Branca	3	4,54	Bark and root	Wine, baths, teas	-	12, 59, 66
Asteraceae							
***Austroeupatorium inulifolium* (Kunth)**	Jurema, jurema-branca	1	1,5	-	-	-	14

Family/Species (synonyms)	Popular name	Quotes	Consensus	Part used	How to use	ICPC category	References
R.M.King & H.Rob. (*Eupatorium inulifolium* Kunth)							
Anacardiaceae							
Anacardium occidentale L	Caju	1	1,5	-	Wine additive	-	30
Apiaceae							
Cyclospermum leptophyllum (Pers.) Sprague ex Britton & P.Wilson (*Pimpinella anisum* S.G.Gmel.)	Gertrudes; aipo-silvestre, mastruço,salsa-do-brejo	1	1,5	-	Wine additive	-	30
Cyperaceae							
Cyperus spp.	Dandá ou Junça	5	7,57	Rhizome	Wine additive	-	1, 6, 11, 41, 65
Solanaceae							
Brunfelsia uniflora (Pohl) D.Don (*Brunfelsia hopeana* (Hook.) Benth.*)*	Jeratacá, Cangambá, Caágambá, Managá,	4	6,06	-	Wine additive	-	2, 11, 41, 65

Family/Species (synonyms)	Popular name	Quotes	Consensus	Part used	How to use	ICPC category	References
	Mercúrio Vegetal						
Brunfelsia latifolia (Pohl) Benth.	Ontem-hoje-a manhã e beije-me rápido	2	3,03	-	Wine additive	-	2, 41
Nitrariaceae							
**Peganum harmala* L.	Arruda da síria	10	15,15	Seeds	Wine additive	-	10, 15, 18, 20, 38, 39, 43, 49, 52, 61
Lamiaceae							
****Vitex agnus-castus*** L	Jurema Branca ou Liamba	10	15,15	-	Wine	-	2, 8, 9, 46, 54, 55, 59, 60, 62, 66
Verbenaceae							
***Lippia lippioides (Cham.) Rusby Lippia chamissonis* Die).**	Jurema, Jureminha	1	1,5	-	Wine	-	14
Passifloraceae							

Family/Species (synonyms)	Popular name	Quotes	Consensus	Part used	How to use	ICPC category	References
Passiflora edulis Sims. (*Passiflora incarnata* L.)	Maracujá, flor-da-paixão	2	3,03	Leaves	Wine additive, beverages, tea	-	15, 43
Myristicaceae							
Myristica fragrans Houtt.	noz-moscada	1	1,5	Fruit	Wine additive	-	65
Malvaceae							
Cola acuminata (P.Beauv.) Schott & Endl.	Cola	1	1,5	-	Wine additive	-	65

3.3. Views taken at the Jurema and *Vachellia farnesiana* Centers

During informal visits to religious centers (Image 1) that use Jurema in their rituals, it was observed that the most commonly used species of Jurema in these locations is *Vachellia farnesiana* (Image 2). In another Jurema house, the Pai de Santo had planted 15 specimens of the species *V. farnesiana*, which he called “Cidade de Jurema” (City of Jurema). All of these specimens are widely used in his spiritual work. In addition, he also has a seedling of black Jurema (*Mimosa tenuiflora*) (Image 2), planted in the house, but which is not used in his practices.

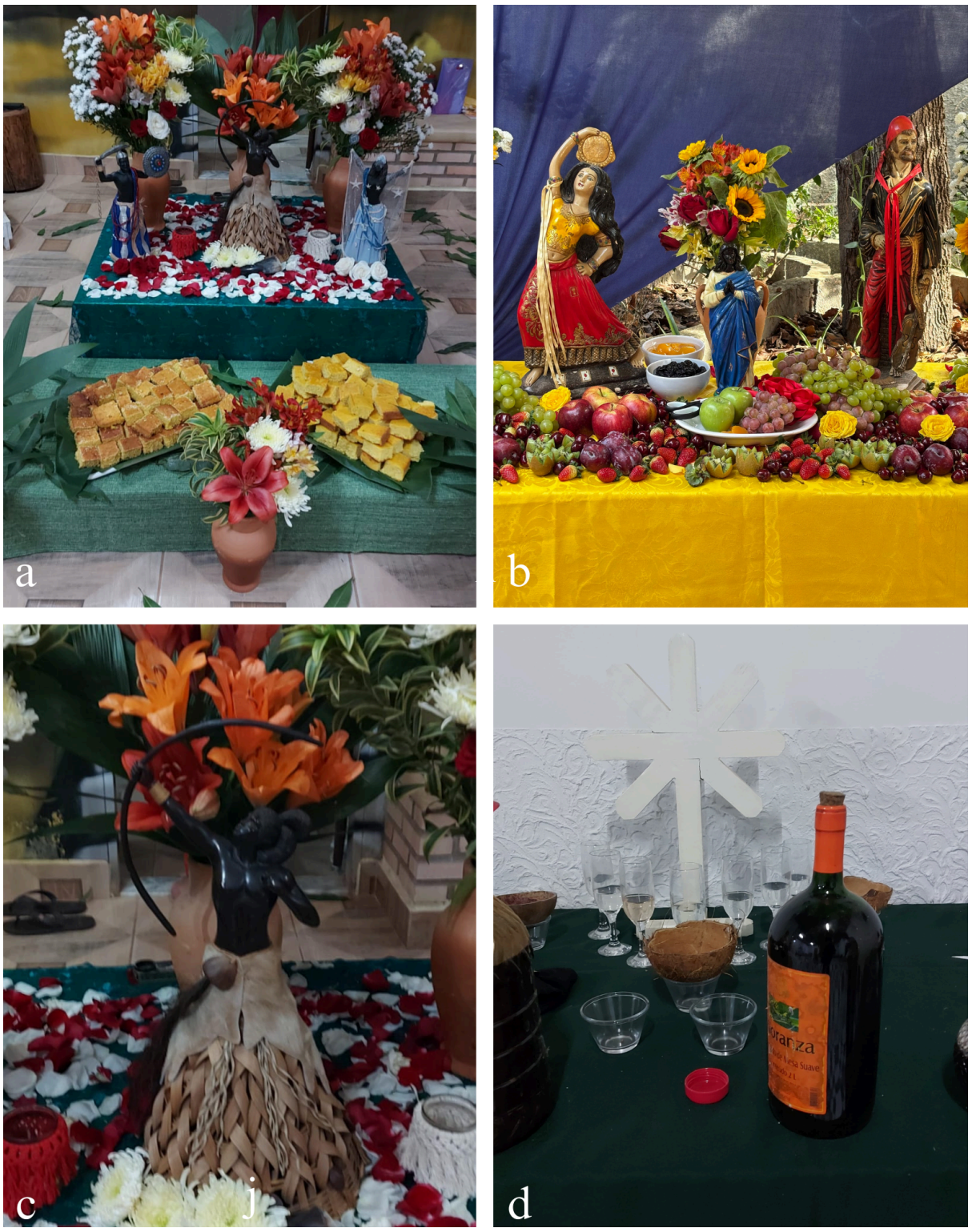

Image 1- a, b-c) Altar of the Houses of Juremas, d) Altar of Jurema Wine. Photos: Santos, N.A. 2024.

Vachellia farnesiana, in addition to being used in the preparation of Jurema Wine, is used in folk medicine, notably for controlling fever and convulsions (Magalhães et al., 2020), as well as having hypoglycemic activity (Oliveira, 2009).

Image 2- a) Flower of *V. farnesiana*, b) Leaf of *V. farnesiana*, c) Green Fruit *V. farnesiana*, d) Flower of *M. tenuiflora*, e) Leaf of *M. tenuiflora*, f) Green Fruit de *M. tenuiflora.* (Photos: a-c Santos, N.A. 2024; d-f Moreira, V.P. 2019)

3.4. Species most frequently mentioned in the preparation of Jurema Wine and used as wine additives

The most frequently cited species used in wine preparation and the number of citations in articles were: *Mimosa tenuiflora* (or its synonyms *Acacia jurema*, *M. hostilis*, and *M. nigra*, 54), *M. verrucosa* (18 times), *Vitex agnus-castus* (10), *M. ophtalmocentra* (7), *Piptadenia retusa* (under *Piptadenia stipulacea* (4)), *Chloroleucon tortum* (under *Pithecellobium tortum*, 4), *Vachellia farnesiana* (under *Acacia farnesiana*, 3), and *Peganum harmala* was the most cited as a wine additive, being cited 10 times. Table 2 also shows other uses of the species, especially medicinal ones. Some species associated with wine production and popularly known as Jurema and some wine additive species were included in Image 3.

Image 3- a) Inflorescence of *Piptadenia retusa*, b) Flower of *Vitex Agnus-Castus,* c) Flower of *Anadenanthera colubrina*, d) Leaves and Fruit of *Anadenanthera colubrina,* e) Flower of *Brunfelsia uniflora,* f) Fruit of *Pithecellobium diversifolium,* g) Leaves of *Pithecellobium diversifolium,* h) Leaves of *Chloroleucon acacioides,* i) Leaves and inflorescence of *Anacardium occidentale*, j) Flower of *M. ophthalmocentra*, k) Fruit of *M. ophthalmocentra*, l) Flower of *M. arenosa.* (Photos: a, c-k Moreira. V.P. 2019; b Novaes, A. 2024; l Santos, N.A. 2024).

According to the data presented in Table 2, it can be observed that several species are used in the production of Jurema wine, while others are used as additives in its preparation. A comparative analysis with the list of species compiled by Albuquerque (1997, 2002) shows that the number of taxa cited by him as Jurema exceeds the 19 species previously recognized by that name. It should be noted that there are a total of 29 species popularly known as Jurema, including species that were not included in the previous list, which increases the number of species popularly known as Jurema in Brazil. In total, there are 12 species of *Mimosa* that are part of the Jurema Complex and are known as Jurema, some of which are used in the preparation of the drink.

3.5. Chemical compounds found in *Mimosa* species

3.5.1. *Mimosa tenuiflora* and *M. ophthalmocentra*

Based on the articles analyzed, 76 chemical compounds were identified in *M. tenuiflora* (Table 3), belonging to four main chemical groups, with saponins, terpenoids, steroids, and alkaloids standing out. For tannins and quinones, the specific chemical compounds were not detailed.

Table 3 - Chemical compounds identified in *Mimosa tenuiflora*, plant parts, and references.

Class/ Chemical compound	Part of the plant	Reference
Alkaloids		
N,N-dimethyltryptamine	*Root	1, 2, 3,4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 23, 24, 25, 37, 38, 39, 41, 42, 43, 44, 49, 50, 53, 59, 61, 62, 64
	*Bark	1, 2, 5, 6, 8, 11, 13, 14, 17, 18, 19, 21, 26, 31, 37, 39, 40, 41, 42, 43, 44, 55, 62, 64
	Leaf and Seed	64
N-methyltryptamine	Leaf and Seed	13, 64
5-hydroxytryptamine	Leaf, Seed and Bark	13, 14, 30
2-methyltetrahydro-β-carboline	Leaf and Seed	13, 64

Ephedrine	Aerial part	23
Yuremamine	*Bark and Root	1, 13, 14, 16, 23, 25, 38, 40, 43, 64
Bufotenin	*Root	25
Flavonoids		
6-desmethoxy-4′-O- methylcapilarise	Leaf	13, 14, 64
	Leaf and Flowers	13
6-methoxy-4-O-methylnaringenin	Leaf and Flowers	13, 64
6-methoxynaringin	Leaf and Flowers	13, 14, 64
Santin	Leaf and Flowers	13, 23, 64
4′,5,7-trihydroxy-3,6-dimethoxyflavone	Leaf and Flowers	13, 23, 64
4′,5-dihydroxy-7,8-dimethoxyflavone	Leaf	64
6-metoxi-kaempferol	Leaf and Flowers	13, 23, 64
Tenuiflorin A	Leaf	13, 14, 64
	Leaf and Flowers	13, 14, 64
Tenuiflorin B	Leaf	13, 14, 64
Tenuiflorin C	Leaf	13, 14, 64
	Leaf and Flowers	13, 14, 64
6-demethoxycapharrisin	Leaf	13, 64
Sakuranetin	Leaf	64
Genkwanin	Leaf	64
Sorbifolin	Leaf	64
5,4′-dihydroxy-7,8-dimethoxyflavone	Leaf	31, 37
5,4′-dihydroxy-7-methoxyflavanone	Leaf	31, 37
5,7,4′-trihydroxy-3-methoxyflavone	Leaf	31, 37, 64
5,6,4'-trihydroxy-7-methoxyflavone	Leaf	37
5,7,4′-trihydroxy-6-methoxyflavonol	Leaf	31, 37, 64
5,6-dihydroxy-7,4'-dimethoxyflavonol	Leaf	37, 64
5-hydroxy-7,8,4′-trimethoxyflavonol	Leaf	31, 37, 64

Naringenin/apigenin	Flowers	23
Luteolin	Flowers	23
Quercetin	Flowers	23
7-methoxy-naringenin	Flowers	23
Isorhamnetin	Flowers	23
Quercetin 3-methyl ether	Leaf	23
Isorhamnetin-3-O-glucosylgallate	Leaf	23
Routine	Leaf	23
Kaempferol 3-O-glycoside	Leaf	23
Myricetin	Leaf and *Root	23, 25
Fisetinidol	*Root	25
Robinetinidol	*Root	25
Myricetin-3-O-rhamnoside	Leaf	23
Hesperidin	Leaf	23
Sinensetin	Aerial part	23
Violantina	Leaf	23
Catechin	Leaf and *Root	23, 25
Epicatechin	Leaf and *Root	23, 25
Epicatechin gallate	Leaf	23
Epigallocatechin gallate	Leaf and *Root	23, 25
Procyanidin A2	Leaf	23
Procyanidin B1	Leaf	23
Terpenes		
Mimosasides A	Leaf, Branches and *Bark	13, 14, 33, 34, 35, 64
Mimosasides B	Leaf, Branches and *Bark	13, 14, 33, 34, 35, 64
Mimosasides C	Leaf, Branches and *Bark	13, 14, 33, 34, 35, 64
8,15-labdanodiol	Leaf	64
Ent-8(17)-labden-15-ol	Leaf	64

Tujona	Sprouts	23
3-carene	Sprouts	23
Saponins		
Campesterols	*Bark	13, 33
Stigmasterol	*Bark	13, 33
Campesterol-3-O-β-D-glycopyranside	*Bark	13, 14, 33, 64
Triterpenoids	*Bark	16
Stigmasterol-3-O-β-D-glucopyranosyl	*Bark	13, 14, 33, 64
β-sitosterol-3-O-β-D-glucopyranosyl	*Bark	13, 14, 33, 64
Lupeol	*Bark	13, 14, 33
β-sitosterol	*Bark	13, 33
Chalconas		13, 14, 36
Kukulkan A	*Bark	13, 14, 34
Kukulkan B	*Bark	13, 14, 34
Tannins	*Bark	14, 28, 29, 31, 32, 35, 37
Phenolic compounds		
Syringic acid	Aerial parts	23
p-coumaric acid	Aerial parts	23
Caffeic acid	Aerial parts	23
Caftaric acid	Aerial parts	23
Chlorogenic acid	Aerial parts	23
Resveratrol	Aerial parts	23
Gallic acid	Aerial parts	23
Quinonas	*Bark	29

(*) Part of the plant used to prepare Jurema wine.

For *M. ophthalmocentra*, there are only records of alkaloids, including DMT, N-methyltryptamine, and Hordeine in stems and roots (Table 6).

Table 4 - Class and chemical compound found in *Mimosa ophthalmocentra*, part of the plant analyzed and reference.

Class/ Chemical compound	Part of the Plant	Reference
Alkaloid		
N,N-dimethyltryptamine	Stem	6, 14, 21
	Root	6, 14, 24
N-methyltryptamine	Root	24
Hordenine	Root	24

3.5.2. Phytochemistry of other *Mimosa* species known as Jurema

For the other *Mimosa* species, only the classes of chemical compounds are listed in the literature (Tables 4 and 5), with only DMT being mentioned for *M. verrucosa*.

Table 5 - Class and chemical compounds identified in *Mimosa verrucosa*, part of the plant used, and references

Class/ Chemical compound	Part of the Plant	Reference
Alkaloid		
N,N-dimethyltryptamine	Root and Stem	6, 12, 53, 66
Flavonoids	Leaf	21,
Steroids	Stem and Root	21
	Stem	21
Saponin	Stem and Root	21,
	Stem	21
Tannins	Stem	21,

Table 6 - The class found in *Mimosa acutistipula*, part of the plant used, and references

Class/ Chemical compound	Part of the Plant	Reference
Alkaloid	Leaf	36
Saponina	Leaf	36
Compostos fenólicos	Leaf	36
Flavonoides	Leaf	36
Taninos	Leaf	36
Quinona	Leaf	37
Terpeno	Leaf	37

For *M. arenosa*, popularly known as Jurema Branca, there is only a record of tannins (Jesus, 2021). *Mimosa pteridifolia* (under *M. adenophylla*), popularly known as Jurema-cor-de-rosa, had no articles that met the inclusion criteria (Table 1), with only a few secondary metabolites reported: tannins, flavones, flavonoids, xanthones, and saponins. The presence of alkaloids was not detected (Silva et al., 2020).

4. Discussion

4.1. Selected articles and analysis of the evolution of publications

Analysis of the data in Figure 1 shows that the number of publications related to Jurema has grown over time, albeit with some evident fluctuations over the years. The linear regression line points to a relatively small average annual increase in scientific output, suggesting that the topic is still relatively unexplored. However, the significant increase in publications in recent years is noteworthy. This is due to the recent use of Juremayahuasca and also because interest in the ritualistic, therapeutic, and recreational use of Jurema has been increasing, which is one of the main reasons for the growth in studies.

4.2. Jurema species cited, parts used, and uses

Botanical and anthropological literature and research conducted at Reflora report the existence of several plant species called “Jurema” and additives for Jurema wine, although some of these records are unreliable, as there are no herbarium vouchers for most of these taxa, as noted by Mota et al. (2006) and the results of the present study.

In the lists compiled by Albuquerque (1997, 2002), 19 species used by the ‘African cultural descendants’ of Pernambuco in the production of Jurema wine and of plants known as Jurema were recorded. Although Albuquerque (1997) reported that he deposited the collected material in the UFP herbarium, the vouchers were not found, not even through consultation with the collection’s curators.

The compilation of species presented in this study (Table 2) shows a greater number of species, including 10 taxa not listed by Albuquerque (1997, 2002): *Vachellia farnesiana*, *Mimosa scabrella*, *Mimosa burgonia*, *Choroleucon acacioides*, *Chloroleucon mangense*, *Chloroleucon tenuiflorum*, *Mimosa simonii*, *Mimosa setosa*, *Mimosa insignis* and *Mimosa gemmulata*. This brings the total to 29 species known as Jurema, some of which are used in the preparation of Jurema wine. Most species called Jurema belong to the Fabaceae family and many to the Mimosoideae tribe, which have similar vegetative morphology, due to the presence of tiny leaflets, aculeus, and some spike-shaped and glomerule inflorescences. This may contribute to the spread of the use of this popular name among this taxonomic group (Mota et al., 2006) and by people who have no botanical knowledge.

The species *M. burgonia* is not registered in the POWO and Flora and Funga databases of Brazil. However, in some articles it is mentioned as popularly known as “Jurema marginada,” in addition to being cited in records related to the preparation of Jurema wine. Google searches reveal both content generated by Artificial Intelligence (AI) and at least one scientific article that references *M. burgonia*.

It can be noted from the list of species compiled in this study (Table 2) that the number of citations for *M. tenuiflora* is significantly higher, indicating that it is the main component of Jurema wine, corroborating what was reported by Albuquerque (1997, 2002) and other authors. Schultes et al. (2001) comment that the Indigenous use of Jurema wine is an almost extinct practice, which makes its study even more important.

However, it is curious to note the mention of species with no recorded occurrence in Brazil in the preparation of Jurema wine, which is the case of *Peganum harmala* L. (POWO,

2025). In the 1990s, this species seems to have gained a worldwide reputation as a pan-potentiator for all shamanic intoxicants and was combined with mushrooms containing psilocybin, Jurema, and *Salvia divinorum* Epling & Játiva leaves (Ott, 2009; Grünewald and Savoldi, 2020). It remains intriguing that its use in Pernambuco occurred at the same time as its global dissemination and before the widespread use of the internet. However, Grünewald and Savoldi (2020) argue that this internationalization symbolizes a reconfiguration of the use of Jurema wine.

Another case is the use of *Lippia lippioides* (Cham.) Rusby (under *L. chamissonis* Die. (Lamiaceae), whose voucher attesting to religious use is not available in the herbarium. As the species has no confirmed occurrence in Northeast Brazil (Salimena and Cardoso, 2020), the citation of this component is a mystery, almost impossible to elucidate.

4.3. Chemical compounds found in *Mimosa* species

Although there is a rich list of species, few have been studied from a phytochemical point of view. However, for all *Mimosa* species studied (*M. acutistipula*, *M. tenuiflora*, *M. ophthalmocentra*, *M. verrucosa*), except *M. pteridifolia*, the presence of alkaloids in their composition has been reported. This may indicate that they could, in fact, replace *M. tenuiflora* in the composition of the wine. Given the frequency of *M. tenuiflora* in the Caatinga, which is a pioneer species widely disseminated in all phytophysiognomies of the biome (Júnior et al., 2011), it is difficult to understand why there are substitute species. It is possible that species have been experimented with and used by practitioners of Afro-Brazilian religions, or even that, because they are called “Jurema” and also because of their similar morphology, people used them believing that they belonged to the species actually used in the preparation of wine by indigenous peoples.

The preparation of Jurema wine in Afro-Brazilian religions is a carefully guarded secret, and only those who have undergone baptism know how it is made (Silva et al., 2010). What we do know is that the main ingredient is the bark of the stems and roots of *M. tenuiflora*, which has the highest concentration of DMT (Camargo et al. 2014), with thornless specimens being preferred (Silva et al., 2010). The research conducted for this literature review shows that some species are used in the preparation of wine as an additive, as shown in Table 2, both to improve the taste of the wine, which is extremely bitter (Silva et al., 2010),

or as amplifiers of sensory effects, as is the case with the addition of *Cyperus* and *Peganum harmala* species (Martinez et al., 2009). Interestingly, Bezerra et al. (2021) demonstrated the presence of DMT in seeds and leaves of *M. tenuiflora*, indicating that other parts of the plant could also be used. However, Caatinga species are deciduous, making the use of stems and roots more obvious. This is because their leaves fall sharply during the dry season.

The entheogenic use of Jurema wine produced only with *M. tenuiflora* has raised some questions, since the known route of absorption of DMT has no effect when taken orally (Camargo et al., 2014) without the presence of a monoamine oxidase inhibitor (MAOI). However, Vepsäläinen et al. (2005) identified a component in the bark of the stem and root of *M. tenuiflora*, called yuremamine, as shown in Table 3, which acts as an MAO inhibitor, facilitating the central activity of DMT when taken orally. Therefore, Jurema wine produced only with *M. tenuiflora* has entheogenic action.

Peganum harmala seeds are also used as a source of MAOIs, as they contain betacarbolines (Gaujac et al. 2012). In addition, many studies have identified the presence of MAOI constituents in *Passiflora* L. species that are used as wine additives, which potentiates the entheogenic effect of wine when taken orally (Gaujac et al., 2012).

According to Ott (1997), *Mimosa verrucosa*, popularly known as Jurema Branca, contains DMT, but there is no data in the literature to confirm this information. Costa (2021) states that *M. verrucosa* contains DMT, as it is a striking characteristic of these *Mimosa* species that they contain DMT in their molecular structure. Therefore, the species known as Jurema Branca do not contain tryptamine alkaloids (Ott, 1997; Souza et al., 2008).

The most reliable and detailed phytochemical analyses available refer to *Mimosa tenuiflora*, which has the largest number of studies on its chemical composition and classes, as shown in Table 3. The compounds are present in different parts of the plant, including leaves, seeds, bark, and root. Among these parts, the bark and root are the most commonly used in the preparation of the Jurema wine.

Although some articles present phytochemical data on the main species used in the Jurema ritual, the only study that analyzed the entheogenic use of *M. tenuiflora* as wine is that of Kaasik et al. (2020). However, in the work of Kaasik et al. (2020), *M. tenuiflora* was used as a substitute for *Psychotria viridis* in Ayahuasca rituals in Europe. There is no data in the literature on the composition of Jurema wine or tea in indigenous and Afro-Brazilian rituals. Perhaps the “secret” is still a reaction to the demonization of the drink in the 17th and 18th centuries (Freire and Apolinário, 2011). Jurema has been widely used in Europe, especially in the Iberian Peninsula, particularly in Portugal, where it is already showing signs

of expansion to other regions, such as Madrid and São Lourenço. In this context, Jurema Houses were founded by Pais de Santo and juremeiro masters, many of them from northeastern Brazil, who migrated to Europe and established their religious spaces (Pordeus, 2014). In addition, *Peganum harmala* and *Mimosa tenuiflora* have been used in neo-shamanic ceremonies in Europe. *P. harmala*, in particular, has been used as a substitute for *Banisteriopsis caapi* or as a potentiating pretreatment in ayahuasca rituals, due to its harmaline content, an alkaloid with monoamine oxidase inhibitor (MAOI) action. *Mimosa tenuiflora* has been used as an alternative source of DMT in the preparation of ayahuasca. Although it is not part of the traditional Amazonian formulation, its use has spread in Europe because it produces similar psychoactive effects and, at the same time, is less expensive and more easily accessible than the species traditionally used in the Amazon (Kaasik et al. 2020).

According to Grunevald (2008), there are also no detailed studies on the possible differences in the composition of Jurema wine produced from *Mimosa tenuiflora* plants with thorns, without thorns, or even from the so-called Jurema-mansa (*M. verrucosa*).

The lists of species that make up Jurema represent an advance in the description of ritualistic knowledge and the Jurema drink, but they are not entirely reliable due to the absence of herbarium vouchers documenting the species, which are difficult to identify. *Mimosa tenuiflora* is the best documented.

5. Conclusion

This review represents an unprecedented and comprehensive effort to gather, critically analyze, and systematize the dispersed knowledge about the plant species associated with the Jurema ritual complex. By integrating ethnobotanical, phytochemical, and herbarium data, the study reveals the breadth and diversity of the species involved, highlighting *Mimosa tenuiflora* as the main candidate for the composition of the ritual wine, while also pointing out significant gaps, such as the absence of botanical vouchers and the lack of studies on the actual chemical composition of the wine itself.

The data presented here demonstrate not only the botanical and cultural complexity surrounding Jurema, but also the urgent need for more robust studies that include precise botanical identification, the use of voucher specimens deposited in herbaria, and detailed phytochemical analyses – both of the plants and of the beverage itself. Such investigations

are essential for the scientific recognition and appreciation of traditional knowledge, as well as for contributing to the safeguarding of the cultural and spiritual heritage associated with Jurema.

This work thus contributes to strengthening the dialogue between science and tradition, promoting respect for Afro-Indigenous cultural practices and encouraging future research that combines scientific rigor with sociocultural sensitivity. By critically and systematically documenting the species, uses, and phytochemical potentials of Jurema, this review provides a solid foundation for new interdisciplinary approaches to one of the most unique and still little-understood rituals within the Brazilian ethnobotanical context.

Annex I

Bibliographic references for the tables

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