Between Nature and Popular Knowledge: The "Burrito" as an Indicator of Cultural Diversity in the Capricorn Bioceanic Route

Entre a Natureza e o Saber Popular: O "Burrito" como Indicador da diversidade cultural na Rota Bioceânica de Capricórnio*

Entre la Naturaleza y el Saber Popular: El "Burrito" como Indicador de la diversidad cultural en la Ruta Bioceánica de Capricornio

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Abstract: Species of the genus *Aloysia* are recognized for their aromatic and medicinal properties, being native to South America and valued by different cultural groups in the countries of the Bioceanic Rout. This study analyzes the distribution and biocultural relevance of *Aloysia polystachya* along the Bioceanic Route, considering traditional health practices, cultural significance, and phytotherapeutic regulatory frameworks in South America. The research is qualitative and exploratory, based on a literature review and documentary analysis from official sources. Content analysis allowed the organization of information into thematic categories linked to the territories and biomes that make up the route. The results indicate that species of Aloysia occur in the "Cerrado", "Pantanal", "Chaco", areas of the Yungas, and the Atacama Desert. These species are part of the daily lives of Indigenous, peasant, and borderland communities, especially through the preparation of infusions and the traditional beverage known as "tereré", consolidating themselves as therapeutic resources and elements of cultural identity. The diversity of contexts reinforces the ethnobotanical value of *Aloysia* within bioceanic landscapes, revealing its medicinal, cultural, and environmental potential. It is concluded that the presence of "burrito" along the Bioceanic Corridor articulates biodiversity, culture, and health, strengthening traditional knowledge and supporting integrated conservation policies.

Keywords: Bioceanic Route; ethnobotany; *Aloysia polystachya*; interculturality; biocultural biodiversity.

Resumo: As espécies do gênero *Aloysia* são reconhecidas por suas propriedades aromáticas e medicinais, sendo nativas da América do Sul e valorizadas por diferentes grupos culturais nos países da Rota Bioceânica. Este estudo analisa a distribuição e a relevância biocultural da *Aloysia polystachya* ao longo da Rota Bioceânica, considerando as práticas tradicionais de saúde, o significado cultural e os marcos regulatórios da fitoterapia na América do Sul. A pesquisa é qualitativa e exploratória, baseada em revisão bibliográfica e análise documental de fontes oficiais. A análise de conteúdo permitiu a organização das informações em categorias temáticas vinculadas aos territórios e biomas que compõem a rota. Os resultados indicam que espécies de *Aloysia* ocorrem no "Cerrado", "Pantanal", "Chaco", áreas das Yungas e no Deserto do Atacama. Essas espécies fazem parte do cotidiano de comunidades indígenas, camponesas e de fronteira, principalmente por meio do preparo de infusões e da bebida tradicional conhecida como "*tereré*", consolidando-se como recursos terapêuticos e elementos de identidade cultural. A diversidade de espécies reforça o valor etnobotânico nas paisagens bioceânicas, revelando seu potencial medicinal, cultural e ambiental. Conclui-se que sua presença ao longo da Rota Bioceânica articula biodiversidade, cultura e saúde, fortalecendo saberes tradicionais e subsidiando políticas integradas de conservação.

Palavras-chave: Rota Bioceânica; Etnobotânica; *Aloysia polystachya*; Interculturalidade; Biodiversidade biocultural.

Resumen: Las especies del género *Aloysia* son reconocidas por sus propiedades aromáticas y medicinales, son nativas de América del Sur y valoradas por diferentes grupos culturales en los países de la Ruta Bioceánica. Este estudio analiza la distribución y la relevancia biocultural de *Aloysia polystachya* a lo largo

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de la Ruta Bioceánica, considerando las prácticas tradicionales de salud, su significado cultural y los marcos regulatorios fitoterapéuticos en América del Sur. La investigación es de carácter cualitativo y exploratorio, basada en una revisión bibliográfica y en el análisis documental de fuentes oficiales. El análisis de contenido permitió organizar la información en categorías temáticas vinculadas a los territorios y regiones ecológicas que conforman la Ruta. Los resultados indican que especies del género *Aloysia* ocurren en el "Cerrado", el "Pantanal", el "Chaco", áreas de las Yungas y el Desierto de Atacama. Estas especies forman parte de la vida cotidiana de comunidades indígenas, campesinas y fronterizas, especialmente a través de la preparación de infusiones y de la bebida tradicional conocida como "tereré", consolidándose como recursos terapéuticos y elementos de identidad cultural. La diversidad de contextos refuerza el valor etnobotánico de *Aloysia* en los paisajes bioceánicos, revelando su potencial medicinal, cultural y ambiental. Se concluye que su presencia a lo largo de la Ruta Bioceánica articula biodiversidad, cultura y salud, fortaleciendo los saberes tradicionales y respaldando políticas integradas de conservación.

Palabras clave: Ruta Bioceánica; etnobotánica; *Aloysia polystachya*; interculturalidad; biodiversidad biocultural.

1 INTRODUCTION

The use of medicinal plants is an ancestral practice present in different cultures worldwide, consolidating itself as a fundamental component of cultural biodiversity and health security. This knowledge, transmitted across generations, integrates symbolic, spiritual and practical dimensions, giving rise to nature-based healing systems. In the Americas, aromatic and medicinal species occupy a central role in sustaining local therapeutic practices and shaping cultural identities, particularly those rooted in indigenous and popular knowledge systems (Moroni; O'Leary; Filloy, 2016).

Among these species, "burrito" stands out, generally identified as *Aloysia polystachya* (Griseb.) Moldenke, but also referred to in the literature as *Aloysia gratissima* (Gillies & Hook.) Tronc. Native to South America, this plant is widely used in folk medicine and phytotherapy in countries such as Brazil, Paraguay, Argentina, and Chile, and is valued by indigenous, rural and urban populations. Its characteristic aroma and its calming, digestive, and antioxidant properties have been documented and corroborated by ethnobotanical and pharmacological studies (O'Leary; Lu-Irving; Moroni, 2016; Moller *et al*., 2020).

Within the context of the Capricorn Bioceanic Route, an international corridor connecting the Atlantic and Pacific oceans through Brazil, Paraguay, Argentina, and Chile, "burrito" acquires particular relevance. Beyond its therapeutic applications, the plant functions as a symbolic element that permeates everyday practices, reinforces local identities, and fosters sociocultural ties (Ferreira; Castilho; Oliveira, 2019). A clear expression of this role is its incorporation into traditional beverages such as "*tereré"* and "chimarrão", which are consumed across different countries along the route to enhance flavor and to confer perceived therapeutic benefits (Ceballos; Perea, 2014; IPHAN, 2021).

Thus, the objective of this study was to analyze the geographical distribution and biocultural relevance of *Aloysia polystachya* ("burrito") along the Bioceanic Route (Brazil, Paraguay, Argentina, and Chile), considering its integration into traditional health practices, its role as a cultural marker, and its relationship with phytotherapeutic regulatory frameworks, contributing to the valuation of regional resources and to the preservation of biocultural heritage within the context of South American integration.

2 MATERIAL AND METHODS

This study is qualitative *in nature*, with an exploratory design and an interdisciplinary approach, grounded in the theoretical frameworks of ethnobotany and cultural geography. The methodology comprised three complementary stages: (i) bibliographic review, (ii) document analysis, and (iii) data interpretation through content analysis.

The bibliographic survey was conducted between 1999 and 2025 in indexed databases such as Scopus, Web of Science, SciELO, PubMed, and Google Scholar. Descriptors werw applied in Portuguese, Spanish, and English, including Aloysia, "burrito", ethnobotany, medicinal use, aromatic use, "*tereré"*, "chimarrão", and the Bioceanic Route of Capricorn. Priority was given to peer-reviewed articles, chapters from specialized books, and reference theses addressing the systematics of the genus *Aloysia*.

In addition to academic literature, institutional documentary sources were examined, including legislation, technical reports, and national pharmacopoeias. For Brazil, documents from the National Health Surveillance Agency (Brazil, 2024) and the Brazilian Institute of Geography and Statistics (IBGE, 2023) were consulted. For Paraguay, publications issued by the Secretariat of the Environment (SEAM) (Plataforma Urbana, 2025) and the National Directorate of Health Surveillance (Paraguay, 2024) were analyzed. In the case of Argentina, sources included the National Administration of Medicines, Food and Medical Technology – Argentina (Argentina, 2013), as well as regional ethnobotanical inventories. For Chile, the Chilean Pharmacopoeia (Chile, 1905) was examined.

These sources enabled the integration of information regarding the presence of *Aloysia polystachya* and other species of the genus within the legal and cultural frameworks of each country, while also reinforcing the analysis of its absence from official pharmacopoeias, despite its widespread traditional use.

Data analysis followed Bardin's (2016) content analysis framework, applied in three phases: (i) pre-analysis, involving the organization and comprehensive reading of the corpus; (ii) material exploration, through systematic coding of the information; and (iii) treatment and interpretation of the results, with thematic categorization.

Based on this systematization, four thematic axes were defined: (1) traditional knowledge and medicinal use of the "burrito"; (2) cultural integration and traditional beverages; (3) bioceanic territories and landscapes; and (4) biocultural value and intangible heritage. Triangulation among scientific literature, official documents, and institutional data sought to ensure validity and interpretative consistency, allowing the presence of burrito to be related to the biomes of the "Cerrado", "Pantanal", and "Chaco", the latter predominant in Paraguay, and to the ecological and biogeographical regions of the Bioceanic Route, the Yungas and the Atacama Desert, as well as to cultural practices in the countries involved.

3 RESULTS AND DISCUSSION

Based on the data collected, it was possible to develop an environmental and cultural overview of the territories crossed by the Bioceanic Route of Capricorn, highlighting the relevance of species of the genus *Aloysia*, especially *A. polystachya*, which is widely associated with traditional practices in Brazil, Paraguay, Argentina and Chile. As noted by Ferreira, Castilho and Oliveira (2019), the Route represents not only a corridor of economic integration but also

a space for cultural exchange, in which the use of medicinal plants reflects the dentities of the border populations.

The systematics of the genus, revised by Siedo (2006), confirms its diversity and wide distribution, while recent studies by Risso, Suárez, and Posadaz (2023) highlight the importance of species such as *A. gratissima* in the medicinal and aromatic heritage of South America. However, the classification of species presents taxonomic challenges that have resulted in the assignment of numerous synonyms, many of them linked to other genera, such as *Lippia* and *Verbena*, evidencing the morphological complexity of the group.

Among the closely related species, *Aloysia citrodora* Paláu, known as "cedrón" or lemon verbena, characterized by larger, lanceolate leaves, and *A. polystachya*, popularly known as “burrito”, a smaller and more highly branched shrub with short, dense inflorescences, are particularly noteworthy. Its small white flowers, arranged in whorls, further reinforce the morphological distinction of the species (Argentina, 2013).

Table 1 highlights the broad range of species present along the Route, revealing specific patterns of diversity and cultural use in each country. In Brazil, *A. polystachya* and *A. gratissima* stand out as the most prominent species, being widely in Mato Grosso do Sul and in the Central-West and South regions, either as infusions, in the preparation of “tereré”, or as a calming and aromatic agent (Brasil, 2024). Additionally, species such as *Aloysia virgata* (Ruiz & Pav.) Juss. and *Aloysia chamaedryfolia* (Cham.) Steud. expand the repertoire of uses, being in medicinal baths or recorded in more restricted traditional practices (Manfron *et al*., 2023; Moreno *et al*., 2024).

In Paraguay, the presence of the “burrito” in “*tereré”* reinforces the plant's link to the country's cultural identity, where *A. polystachya* is one of the most common traditional complements. *A. gratissima* is also strongly associated with beverages and infusions, whereas *A. scorodonioides* has records restricted to dry environments, reflecting more limited uses (Passos *et al*., 2009; Siedo, 2006; O’Leary *et al*., 2016; Brid; List; Messineo, 2022).

In Argentina, the greatest diversity is observed, with six species recorded, including *A. citrodora* ("cedrón"), traditionally consumed in teas, and *A. castellanosii*, which presents a restricted occurrence. In this context, “burrito” (*A. polystachya*) is widely used in regions such as the “Chaco” and northern Argentina, while *A. virgata* and *A. chamaedryfolia* reinforce the ornamental and aromatic dimension of the local tradition (Siedo, 2006; Muñoz-Velázquez *et al*., 2012; Ceballos; Perea, 2014; O’Leary *et al*., 2016; Retta *et al*., 2022; Risso; Suárez; Posadaz, 2023).

In Chile, the predominance of *A. citrodora* (“cedrón de Chile”) highlights the importance of the species in folk medicine. However, records also indicate the occurrence of *A. polystachya* in central Mediterranean areas and of *A. gratissima* to a lesser extent, revealing the genus’s adaptation to diverse ecological conditions (Siedo, 2006; Carnat; Fraiss; Lamaison, 2010; Moller *et al*., 2020; Risso; Suárez; Posadaz, 2023).

This set of information demonstrates that, among the 14 species recorded across the four countries, two exhibit a more consolidated role in popular use and cultural representation: *A. polystachya* (“burrito”) and *A. gratissima*. Both species are integrated into cross-border cultural practices, particularly in the preparation of infusions and “tereré”. Others species, such as *A. citrodora* and *A. virgata*, assume complementary functions, at times reinforcing phytotherapeutic practices and, at other times, acting as ornamental species and markers of regional identity (O’Leary *et al*., 2016; Retta *et al*., 2022).

Table 1 – Diversity of *Aloysia* species and their traditional uses in the countries of the Capricorn Bioceanic Route

Countries	Species	Popular names and uses
Brazil	*Aloysia polystachya* (Griseb.) Moldenke	"Burrito" or "chá de burro" Very common in Mato Grosso do Sul, used in infusions and in "*tereré"*.
	Aloysia gratissima (Gillies & Hook) Tronk	"Erva-de-burro", "chá-de-cavalo" or "burrito"-branco". Used in the Central-West and Southern regions, with aromatic and calming properties.
	Aloysia virgata (Ruiz & Pav.) Juss.	"Jazmin-do-campo" or "alecrim-de-caboclo". Used in medicinal baths.
	Aloysia chamaedryfolia Cham. *Steud*.	Limited diffusion in popular use; recorded in areas of Southern and Southeastern Brazil.
Paraguay	*Aloysia polystachya* (Griseb.) Moldenke	"Burrito". Widely used in "*tereré"* infusions.
	Aloysia gratissima (Gillies & Hook) Tronk	Té de burro" or "burrito" "blanco".
	Aloysia virgata (Ruiz & Pav.) Pers.	Ornamental and aromatic species.
	Aloysia scorodonioides (Kunth) Cham.	Known in dry areas, with limited medicinal use.
Argentina	*Aloysia citrodora* Paláu	"Cedrón" or lemon verbena. Widely used in traditional teas.
	Aloysia polystachya (Griseb.) Moldenke	"Burrito". Popular in the "Chaco" region and northern Argentina.
	Aloysia gratissima (Gillies & Hook) Tronk	Used as an aromatic and medicinal plant.
	Aloysia virgata (Ruiz & Pav.) Pers.	"Jazmín del país". Aromatic and ornamental.
	Aloysia chamaedryfolia Cham.	Endemic to subtropical areas.
	Aloysia castellanosii Moldenke	Described for restricted environments in Argentina
Chile	*Aloysia citrodora* Paláu	"Cedrón de Chile". Highly traditional in folk medicine.
	Aloysia polystachya (Griseb.) Moldenke	Present in Mediterranean and central transition areas.
	Aloysia gratissima (Gillies & Hook) Tronk	Less common, but recorded in botanical studies.

Source: Elaborated by the Authors based on data compiled and systematized from Argentina (2013), Ceballos and Perea (2014), Moroni, O'Leary and Filloy (2016); Arrúa, González and Ferro (2019), Moller *et al*. (2020), Brid, List and Messineo (2022), Manfron *et al*. (2023) and Brasil (2024).

Thus, the simultaneous presence of these species across different ecological and sociocultural contexts reinforces the abundance of the genus in South America and highlights its integration into bioceanic landscapes as a strategic medicinal, cultural, and environmental resource. In this sense, understanding the diversity of *Aloysia* along the Route also entails recognizing its biocultural dimension, with particular emphasis on "burrito" (*A. polystachya*), whose geographic distribution and cultural role are consolidated as central to this study (Figure 1).

Figure 1 – Botanical characteristics and distribution of *Aloysia polystachya* (Griseb.) Moldenke in the countries of the Capricorn Bioceanic Route



Source: map constructed by the Authors (2025) based on Moroni, O'leary and Filloy (2016) for species of the genus *Aloysia*.

Along the Capricorn Bioceanic Route, different localities display environmental and cultural characteristics that highlight the biocultural diversity of the territory. In Brazil, Campo Grande, the capital of Mato Grosso do Sul, expresses the regional cultural identity, marked by the consumption of "*tereré"* and by Guarani influence, as evidenced by the use of *A. polystachya* (Moreno *et al*., 2024). Porto Murtinho, located on the banks of the Paraguay River, reflects a "Pantanal" and borderland identity, with particular emphasis on the use of medicinal plants. In these areas, the presence of *Aloysia gratissima* var. *gratissima*, a species also known as "burrito" (Table 1), adapted to the ecotonal zones of the "Cerrado", "Pantanal", and "Chaco", reinforces the role of these municipalities as strategic spaces for the preservation of ethnobotanical practices (Moroni; O'Leary; Filloy, 2016). This broad territorial distribution of the *A. gratissima* complex is associated with the coexistence of different varieties, since *A. gratissima* var. *gratissima* and *A. gratissima* var. *sellowii* do not exhibit geographic separation in southern South America and occupy similar ecological niches, differing mainly in leaf blade size (Moroni; O'Leary; Filloy, 2016).

In Paraguay, the city of Carmelo Peralta is located in the Humid "Chaco", a region of alluvial plains marked by Guarani and riverside cultural traditions, where "tereré" consumption and family farming are central practices. Further west, Mariscal Estigarribia represents the dry "Chaco", characterized by indigenous traditions and extensive livestock production, while in Pozo Hondo the peasant way of life and the continued use of native plants stand out. In these territories, populations of *A. gratissima* and *Aloysia decipiens* Ravenna predominate, species distributed across the arid and semi-arid environments of the "Chaco" (Moroni; O'leary; Filloy, 2016).

In Argentina, the locality of Misión La Paz, located in the dry "Chaco", reflects the mixing of Andean and "Chaco" an populations, characterized by traditional agricultural practices. In Tartagal, situated in the Yungas, a region of ecological transition between the "Chaco" and the

Andes, marked by humid montane forests, Andean culture is associated with a strong Indigenous presence, while Jujuy, in the high Andes, is characterized by high-altitude agriculture and Quechua traditions. Salta, also located within the Yungas, combines colonial and Indigenous heritages and stands out for its agricultural production. In these regions, the occurrence of *Aloysia schulziana* Moldenke and the variety *A. schulziana* var. *sellowii* follows ecological and sociocultural gradients. At Paso de Jama, a mountain pass and international border between Argentina and Chile, located between the province of Jujuy and the Antofagasta Region, the extreme environment of the Altiplano supports transhumance and mining practices, in contexts where *Aloysia* species reflect adaptation to high-altitude conditions (Moroni; O'Leary; Filloy, 2016; Retta *et al*., 2022).

In Chile, towns like Antofagasta, Mejillones, and Iquique are located within the Atacama Desert, considered the driest in the world. Antofagasta exhibits a coastal and port-based identity, with a strong influence from mining and fishing and industrial profile. Mejillones shares similar environmental conditions but stands out for its fishing and industrial profile. Iquique, in turn, combines elements of port and commercial culture and marked by a strong tourism vocation. In these coastal cities, the presence of *Aloysia oblanceolate* Moldenke, adapted to rocky and arid soils, complements local practices and reinforces the link between biodiversity and cultural heritage (Moroni; O'leary; Filloy, 2016; Moller *et al*., 2020).

Thus, in the Brazilian segment of the Route (Mato Grosso do Sul) and in eastern Paraguay, *A. gratíssima*, particularly *A. gratíssima* var. gratíssima, is the taxon most commonly used in popular culture. In the Argentine and Paraguayan "Chaco", a combination of *Aloysia decipiens* Ravenna, an Argentine adapted endemic to xeric environments, and *A. schulziana*, native to northwestern Argentina and Paraguay and associated with rocky substrates, is observed. In humid and rocky transitional zones of northeastern Argentina and southern Brazil, *A. gratíssima* var. sellowii occurs, whereas *A. oblanceolata* is typical of southern Paraguay, southern Bolivia, and southern Brazil, and was not documented as native to northern Chile in the reference study (Moroni; O'leary; Filloy, 2016).

Data analysis, guided by the content analysis technique proposed by Bardin (2016), revealed central dimensions related to the use of "burrito" (*A. polystachya*) along the Bioceanic Route. Traditional knowledge highlights the species for its digestive, calming, and refreshing properties, which are widely incorporated into popular health care practices, especially through infusions and in the preparation of "*tereré"*, a traditional cold-consumed beverage. In Campo Grande, observations conducted at the Antônio Valente Municipal Market confirmed the commercialization of "burrito" at stalls specialized in herbs specifically intended for the preparation of "*tereré"*. This beverage, recognized as intangible cultural heritage of Mato Grosso do Sul, is traditionally prepared by cold infusion and constitutes one of the most recurrent forms of "burrito" consumption. The association of "*tereré"* with this species articulates regional practices of sociability with the continuity of Indigenous and Paraguayan knowledge that historically shaped this cultural tradition (IPHAN, 2021; Manfron *et al*., 2023).

Beyond popular trade observed in Campo Grande, the plant is incorporated into industrialized products marketed by regional companies, such as yerba mate blends enriched with "burrito" extracts, revealing the articulation between tradition and innovation in the valorization of local resources. These uses are supported by scientific studies demonstrating its anxiolytic, antioxidant, and anti-inflammatory effects, thereby validating popular practices and reinforcing the plant's presence in everyday regional life (Barrios *et al*., 2016),

Thus, the "burrito" reveals a distinctive biocultural value by articulating biodiversity, popular health practices, and intangible heritage. Its presence within social circuits, in both formal and informal markets, and in border contexts reaffirms its role as an indicator of biocultural diversity along the Bioceanic Route, contributing to the understanding of the interactions between nature, culture, and sustainable development. This interpretation is corroborated by the information systematized in Table 2, which brings together traditional uses, scientific evidence, and categories of analysis of the "burrito" in different locations in Brazil and South America, highlighting the territorial breadth, the diversity of ethnobotanical practices, and the relevance of the intangible heritage associated with the species. In these contexts, the plant assumes both ecological and cultural relevance, reinforcing its status as a territorial marker.

Table 2 – Traditional uses, scientific evidence, and content analysis (Bardin, 2016) of *Aloysia* species in the countries of the Capricorn Bioceanic Route

Municipality / Locality	**Traditional use of "burrito"**	**Scientific evidence**	**Bardin's categories (2016)**	**Ref.**
Mariscal Estigarribia, Paraguay	Regional phytotherapeutic use	Pharmacological validation in animal models	Cultural integration and traditional beverages	Mora *et al.* (2005)
Argentina, Paraguay, Chile	Calming, digestive, and aromatic uses	Chemical composition and taxonomic studies	Scientific basis and taxonomic validation	Siedo (2006)
Chile	Historical medicinal use	Essential oils and pest control studies	Biodiversity and conservation policies	Carnat *et al.* (2010)
Argentina	Sedative, anxiolytic, digestive	Anxiolytic and anticonvulsant activity	Traditional knowledge and medicinal use of "burrito"	Santillán *et al.* (2013)
Tucumán, Argentina	Digestive, tranquilizing, stomach infusions	Ethnobotanical survey	Traditional knowledge and medicinal use of "burrito"; Biocultural value and intangible heritage	Ceballos; Perea (2014)
Brazil, Argentina, and Paraguay	Digestive, calming, antiseptic, and aromatic	Taxonomic and systematic revision of the genus	Integration of traditional knowledge with biomedical science	O'Leary *et al.* (2015)
Paraguay	Popularly used as a calming and digestive agent and for emotional well-being	Hydroalcoholic extract demonstrated antidepressant effects in Swiss albino mice (tail suspension test)	Popular use and cultural practices; Scientific and experimental validation	Barrios *et al.* (2016)
Southern Cone: Brazil, Paraguay, Argentina, Uruguay, Chile	Broad use in infusions, *"tereré"*, "chimarrão", and regional medicinal practices	Taxonomic delimitation of the *Aloysia gratissima* complex into four species (*A. decipiens*, *A. gratissima* var. *gratissima* and var. *sellowii*, *A. oblanceolata*, and *A. schulziana*), based on the phylogenetic species concept and detailed morphological analysis	Scientific basis and taxonomic validation; Botanical identification and quality control	Moroni; O'Leary; Filloy (2016)
Central Region, Chile	Calming and digestive; traditional use in *"tereré"* and infusions	In vitro antioxidant and antiproliferative activity	Traditional knowledge; Biodiversity and conservation policies	Moller *et al.* (2020)
Indigenous territories of the Gran "Chaco"	Natural calming agent and remedy for stomach pain; digestive infusion	Traditional knowledge: anxiolytic and antidepressant activity	Cultural and linguistic representations	Brid, List e Messineo (2022)

Municipality / Locality	**Traditional use of "burrito"**	**Scientific evidence**	**Bardin's categories (2016)**	**Ref.**
Mato Grosso do Sul (Brazil) / Brazilian Central-West region	Used by healers for cardiovascular conditions; digestive, sedative, respiratory, and gastrointestinal uses	Extract showed cardioprotective and nephroprotective effects; essential oil exhibited cardiovascular protective effects	Popular use and experimental validation	Manfron *et al.* (2023)
Brazil, Argentina, Paraguay, and Uruguay	Stress relief, digestive, analgesic, antiseptic	Antioxidant, antimicrobial, anti-inflammatory, and anxiolytic activities	Pharmacology; Scientific review; Traditional use	Retta *et al.* (2022)
Argentina, Uruguay, and Chile	Sedative, antispasmodic, digestive, anxiolytic; treatment of pain and respiratory diseases	Anxiolytic, antioxidant, antimicrobial, and anti-inflammatory activities	Traditional use; Ethnobotany; Pharmacology	Risso; Suárez; Posadaz (2023)
Mato Grosso do Sul, Brazil	Infusion used for heart conditions, known as "heart herb" or cardiac calming agent	Cardioprotective effects	Medicinal use; Potential therapeutic application	Moreno *et al.* (2024)

Source: elaborated by the authors (2025) based on data compiled and systematized from references cited in the table.

The synthesis of the evidence gathered for the Bioceanic Route confirms the "burrito" (*A. polystachya*) as an indicator of biocultural diversity, articulating traditional knowledge, health practices, and distinct ecological contexts. In light of Bardin's (2016) content analysis, the information in Table 2 is validated by three complementary axes: i) pharmacological and taxonomic robustness, ii) sociocultural rootedness in everyday beverages and rituals, iii) territorial anchoring in "Chaco" an, "Yungas Andina" ecoregions, and arid coastal landscapes.

First, the dimension "Traditional knowledge and medicinal use of "burrito" is supported by extensive literature that attributing digestive, calming, and anxiolytic effects to the species, frequently used in infusions and in the preparation of "*tereré"* and "*chimarrão"*. Pharmacological and phytochemical studies (Retta *et al*., 2022; Risso; Suárez; Posadaz, 2023) describe anxiolytic, antioxidant, anti-inflammatory, and antimicrobial activities, converging with both classic and contemporary reports of popular use. This convergence between traditional use and laboratory evidence supports the "Scientific Evidence" column, reinforcing the categories "Pharmacology and Scientific Validation" and "Traditional and Medicinal Use." The experimental results are aligned with ethnobotanical knowledge, indicating coherence between empirical practice and pharmacological validation. Reliability of this evidence is further strengthened by taxonomic validation and botanical standardization of the genus *Aloysia* (Siedo, 2006; O'Leary; Lu-Irving; Moroni, 2016), which are essential for ensuring reproducibility and safety.

In the sociocultural context, Table 2 highlights the categories "Cultural integration and traditional beverages" and "Biocultural value and intangible heritage." References such as Brid, List, and Messineo (2022) demonstrate that the "burrito" structures practices of sociability and regional identities in the Southern Cone, especially through "*tereré"* and, to a lesser extent, "chimarrão". Its use in hot and cold infusions is associated with digestive comfort, freshness, and psychological well-being, corresponding to the attributes highlighted in the "Traditional use" column. In border contexts, such as Ponta Porã (MS) and Pedro Juan Caballero (Paraguay), the plant circulates through home gardens, markets, and fairs, symbolizing the transnationality circulation of knowledge and products. These findings directly validate the categories "Biocultural value and intangible

heritage" and "Integration of traditional knowledge with biomedical science," by demonstrating the coexistence of community-based practices, formal markets, and scientific research.

The territorial anchoring of the practices described is further confirmed through a comparative analysis of the "Chaco" an environment of Paraguay, the ecological gradients of northern Argentina, and the hyperarid fringes of northern Chile. In Paraguay, districts such as Carmelo Peralta, Mariscal Estigarribia, and Pozo Hondo, located in the Humid "Chaco" and Dry "Chaco", present transitional landscapes and climates marked by pronounced dry periods, in which "burrito" is integrated into local food systems and therapeutic routines (Arrúa; González; Ferro, 2019).

In Paraguay, Barrios *et al*. (2016) investigated the popular use of *A. citriodora* (cedrón), traditionally employed in various regions of the country as a calming and digestive aid. Through trials using experimental models, the authors demonstrated a significant antidepressant effect of the hydroalcoholic extract, thereby scientifically validating aspects of popular knowledge. The results reinforce the therapeutic potential of the species, bringing traditional practices closer to pharmacological evidence. Such findings support the Paraguayan context, in which popular use is articulated alongside experimental validation and botanical inventories that attest to the occurrence and social recognition of the species (Arrúa; González; Ferro, 2019).

In Argentina, records extend from the dry "Chaco" to the Yungas and the high Andes, encompassing locations such as Misión La Paz, Tartagal, Jujuy, and Salta. In Misión La Paz and Tartagal, the presence of "burrito" in calming and digestive infusions coincides with the strong indigenous and Andean influences, characterized by family-based agriculture and continuous use of medicinal plants (Siedo, 2006; Retta *et al*., 2022). In high-altitude environments, such as Jujuy and the Salta region, the phytotherapeutic repertoire is extensive, however, the use of "burrito" tends to decline under extremely cold and dry conditions. Even so, the literature indicates the persistence of digestive and sedative uses among specific population groups and within lower-altitude corridors (Fabbroni *et al*., 2022). By composing a mosaic that integrates climate, altitude, culture, and plant circulation, the Argentinian data support the category "Bioceanic Territories and Landscapes," as the use of "burrito" follows routes of ecological adaptation and cultural exchange.

In northern Chile, Antofagasta, Mejillones, and Iquique, located in the Atacama Desert, exhibit pronounced floristic and hydrological constraints. Even so, Table 2 records a history of medicinal use, with emphasis on infusions with calming and digestive effects, as well as chemical studies focusing on essential oils (Siedo, 2006; Moller *et al*., 2020). This evidence demonstrates that, even under extreme environmental conditions, "burrito" appears in adapted practices and formal commercial networks, composing the category "Biodiversity and conservation policies" and reiterating the capacity of the species, and associated knowledge, to circulate through urban port areas and coastal desert environments. From the perspective of expanded cultural circulation, reviews such as those by Risso, Suárez, and Posadaz (2021) confirm the presence of "burrito" in Argentina, Chile, Uruguay, and other regions, highlighting its role in digestive and aromatic preparations and consolidating its pharmacological profile.

In Mato Grosso do Sul, recent studies validate the popular uses associated with cardiovascular health: extracts and essential oil have demonstrated cardioprotective effects in experimental models without acute toxicity (Manfron *et al*., 2023; Moreno *et al*., 2024), indicating that the plant is transitioning from the sphere of popular home garden to the field of applied pharmacology.

Overall, the material systematized in Table 2 demonstrates coherence among its columns. In "Traditional Use," digestive, calming, anxiolytic, and, in some cases, antispasmodic and carminative attributes predominate; in "Scientific Evidence," *in vivo* and *in vitro* studies confirming anxiolytic, antidepressant, anti-inflammatory, and antioxidant effects are compiled. Bardin's (2016) analysis categories structur this dialogue among "Popular Use and Cultural Practices," "Pharmacology and Scientific Validation," "Scientific and Taxonomic Basis," "Cultural and Linguistic Representations," and "Biodiversity and Conservation." This coherence indicates that local practices and scientific knowledge are mutually reinforcing, legitimizing the "burrito" both as a community-based therapeutic resource and as an object of conservation and cultural valorization policies.

From an interpretative perspective, it becomes evident that the presence of "burrito" in popular circuits (fairs, home gardens, and markets) and industrialized products ("tereré" mixes) mediates the transition from empirical knowledge processes of standardization and quality control, an indispensable step for safe and effective phytotherapy.

This trajectory is already apparent in taxonomic protocols and pharmacological syntheses (Retta *et al*., 2022), supporting agendas related to "food and nutritional security," "regional public health," and "conservation of ecosystem services," categories implicit reflected in the narratives presented in Table 2. Complementarily, studies on indigenous language and symbolism in the Gran "Chaco" (Brid; List; Messineo, 2022) indicate that semantic fields associated with relief, tranquility, and care permeate the uses of the species, helping to explain its persistence in border regions and contexts of mobility.

3.1 Biocultural Heritage and Phytotherapeutic Regulation of *Aloysia* Species in South America

In different regions of the Southern Cone, species of the genus *Aloysia* constitute part of a consolidated repertoire of therapeutic and food-related practices that link everyday care, sociability, and territorial identity. Along the Bioceanic Route of Capricorn, this repertoire is expressed with particular clarity through the use of "burrito" and related species, which are locally recognized for their digestive and calming attributes, especially in infusions and "*tereré"*. However, a recurrent mismatch is observed between cultural centrality and technical-sanitary formalization: the social circulation of traditional use does not automatically translate into uniform pharmacopoeial recognition. This discrepancy generates regulatory asymmetries that are relevant to public health, commercial exchange, and the safeguarding of intangible heritage along the bioceanic corridor (Table 3).

Table 3 – Regulatory status of *Aloysia* species in pharmacopoeias in the countries comprising the Bioceanic Route

Country	Regulatory framework	Status of *Aloysia*
Brazil	Brazilian Pharmacopoeia and Herbal Medicines Formulary (Brazil, 2024).	Officially cited as a species of medicinal interest; regulated for use in phytotherapeutic formulations.
Paraguay	Referenced in international pharmacopoeias; regulation by the National Directorate of Health Surveillance (Paraguay, 2024).	No official monograph; widely used in "*tereré"* infusions and strongly associated with Guarani cultural identity.

Country	Regulatory framework	Status of *Aloysia*
Argentina	Laws No. 16,463 and No. 17,565; national resolutions; Argentine Pharmacopoeia, 7th edition (Argentina, 2013/2018).	The Argentine Pharmacopoeia (2013/2018), 7th edition, lists four native monographs, including "cedrón" (*Aloysia citrodora*).
Chile	Chilean Pharmacopoeia – University of Chile and Government (Chile, 2014).	Not included; properties recognized in recent scientific studies, but without official registration.

Source: prepared by the authors (2025).

In Brazil, the Brazilian Pharmacopoeia constitutes the official national pharmaceutical code and establishes minimum quality requirements for inputs and products of sanitary interest. The approval of the 7th edition through a recent regulatory act reinforces the role of the Pharmacopoeia as an instrument of standardization and safety. Within this context, the presence of the genus *Aloysi*a in popular circuits, such as fairs, markets, herb stalls, and regional "*tereré"* production chains, highlights a strategic interface between traditional use and regulation. Botanical and physicochemical standardization thus represents a decisive step in transforming widespread traditional use into a safe pathway for phytotherapeutic application, without diminishing the cultural diversity that sustains these practices.

In Paraguay, "burrito" is strongly associated with traditional health practices, particularly in infusions used in the preparation of "*tereré"*, a symbol of Guarani cultural identity and border sociability. Despite its widespread use and support from ethnobotanical studies, the species does not have an official monograph in the Paraguayan Pharmacopoeia. According to the Dirección Nacional de Vigilancia Sanitaria (DINAVISA) (Paraguay, 2024), the country adopts international pharmacopoeias as official references for the quality control of natural products, establishing a technical verification framework that simultaneously highlights the absence of specific national monographs for plants with strong cultural roots. This regulatory orientation, made explicit in DINAVISA institutional resolutions, helps to explain why species that are socially central to "*tereré"* practices remain outside national compendia: normative validation tends to rely on external references, to the detriment of regulatory systems oriented towards native species and traditional regional uses. In this context, the official recognition of the "burrito" emerges as a strategic step towards valuing Paraguayan phytotherapeutic heritage, aligning sanitary safety with cultural identity.

In Argentina, *A. polystachya* is traditionally used as a digestive plant, particularly in the treatment of gastrointestinal disorders such as indigestion, and is frequently consumed in infusions with a calming and stomachic effect. Ethnobotanical studies reinforce its relevance in folk medicine, especially in the northern regions of the country and the Argentine Gran "Chaco". However, within the framework of official regulation, the 7th edition of the Argentine Pharmacopoeia (Argentina, 2013), supported by Laws No. 16,463 and No. 17,565 and by resolutions issued by the National Administration of Medicines, Food and Medical Technology, includes monographs of native species of the genus *Aloysia*, such as *Aloysia citrodora*, culturally known as "cedrón," but does not include *A. polystachya* (Table 3).

The Argentine Pharmacopoeia establishes technical criteria such as parameters for botanical identification and minimum essential oil content in the leaves of "cedrón". The Argentine experience thus demonstrates that the inclusion of monographs for species of the Genus represents a significant regulatory advance, even if it does not automatically imply the

incorporation of all ethnobotanical categories present in border regions, such as "burrito". This limitation is particularly relevant in light of taxonomic challenges, synonymy, and morphological proximity among species. In this sense, applied taxonomy and quality control emerge as structural steps for expanding institutional recognition without distorting the social and cultural uses associated with medicinal plants.

In Chile, species of the Genus *Aloysia* are recognized for their antioxidant and calming properties, and have been the subject of recent pharmacological and ethnobotanical studies, particularly in the central region of the country. The Chilean Pharmacopoeia, developed under the academic coordination of the University of Chile and approved by the government, adopts rigorous and highly selective criteria for the inclusion of monographs. This approach helps to explain the absence of *A. polystachya* and other species of the genus in its official compendia, despite their documented popular use (Chile, 1905). Within the context of the Bioceanic Route, this situation highlights an institutional asymmetry that is common across several countries along the corridor: scientific and cultural recognition of medicinal plants does not necessarily translate into immediate normative incorporation.

Nevertheless, the continued use of "burrito" in local and cross-border contexts, including arid environments and areas with high ecological constraints, demonstrates its relevance within South American biocultural biodiversity and its close relationship with the territories traversed by the Bioceanic Route. A comparative analysis of different locations, ranging from the Brazilian "Cerrado" to the Chilean Atacama Desert, reveals consistent patterns of association with indigenous and peasant cultures, presence in ecotonal regions such as the "Chaco" and the Yungas, and integration into popular networks of care and sociability, particularly through "*tereré"* and medicinal infusions.

The absence of certain species in official pharmacopoeias should not be interpreted merely as a regulatory gap, but as a reflection of regulatory models that operate in a gradual, selective, and strongly technical manner, which are not always aligned with the territorial and cultural dynamics of traditional uses. This asymmetry poses challenges to regional development by limiting value aggregation, traceability, and the structuring of sustainable production chains based on socio-biodiversity resources.

Strengthening phytotherapeutic regulation within the context of the Bioceanic Route thus emerges as a strategic element for regional integration, enabling the articulation among biodiversity, territoriality, and the local economy. In this sense, the appreciation of "burrito" forms part of a regional development agenda that recognizes traditional knowledge as a territorial asset and promotes conservation in combination with the sustainable use of natural resources.

4 FINAL CONSIDERATIONS

The findings of this research support the interpretation that "burrito" (*Aloysia polystachya*) and closely related species of the *Aloysia gratissima* complex, according to the taxonomic literature, functions as a biocultural indicator along the Capricorn Bioceanic Route, insofar as it brings together, within a single element, dimensions that are usually analyzed separately. These dimensions include: (i) ecological adaptability, expressed by the broad occurrence of the genus in contrasting biomes, such as "Cerrado", "Pantanal", "Chaco", Yungas and arid zones; (ii) sociocultural circulation, materialized in cross-border practices involving infusions and in

"*tereré"* as a social technology of sociability and care; and (iii) sanitary relevance, evidenced by the convergence between traditional use and pharmacological studies that describe digestive, calming and antioxidant effects.

From a territorial perspective, "burrito" acts as a bridge between landscapes and identities, circulating through markets, fairs, home gardens, and manufactured products, particularly in border regions characterized by intense mobility. This dynamic contributes to repositioning the Bioceanic Route not only as a logistics corridor, but as a corridor of knowledge, in which biodiversity becomes legible through cultural practices. In this sense, the "burrito" transcends the condition of a simple plant resource, assuming the role of low-cost cultural infrastructure sustained by intergenerational transmission networks, shared linguistic repertoires, and local regimes of trust.

The study also highlights a recurring structural tension in the bioceanic corridor: the strength and continuity of popular use do not automatically translate into harmonized regulatory recognition. Although pharmacopoeias and official regulatory frameworks include monographs of species of the genus, such as "cedrón" (*Aloysia citrodora*) in the Argentine Pharmacopoeia and guidelines present in the Brazilian Pharmacopoeia, the "burrito" remains, along much of the Route, in an intermediate zone between tradition, trade, and technical-sanitary standardization. This scenario reinforces the need for integrated public policies that articulate botanical identification and traceability, quality control of raw materials, and the safeguarding of intangible heritage associated with traditional practices, such as "*tereré"* and social circuits.

In this context, recognizing the "burrito" as an indicator of biocultural diversity along the Bioceanic Route expands the analytical and applied potential of the topic by articulating biodiversity conservation, traditional health practices, and territorial integration.

Therefore, the systematization of the data highlights the importance of comparative approaches that consider, in an integrated manner, the sociocultural, ecological, and institutional dynamics of the countries involved along the Bioceanic Route. In this sense, the "burrito" constitutes an emblematic case, whose analysis offers a methodological and conceptual framework that can be applied to other species of South American socio-biodiversity associated with traditional health practices and territorial identity. Thus, the "burrito" emerges not only as an object of ethnobotanical interest, but also as a strategic reference for public policies, initiatives aimed at valuing intangible heritage, and integrated health and sustainability actions, contributing to the strengthening of regional integration on socio-biodiverse foundations.

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Lilian Ottoni da Silva: Responsible for systematizing data on the other species of the genus Aloysia, with an emphasis on geographic, territorial, and environmental data, as well as for drafting the corresponding analytical sections.

Amanda Carolina Borges da Silva: Responsible for surveying, comparatively analyzing, and systematizing the phytotherapeutic legislation in force in the four countries that comprise the Bioceanic Route (Brazil, Paraguay, Argentina, and Chile), as well as for drafting the normative sections of the manuscript.

Ademir Kleber Morbeck de Oliveira: Responsible for the taxonomic identification of species of the genus Aloysia, nomenclatural validation using specialized botanical databases, and contribution to the drafting of the taxonomic and methodological sections of the article.

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Data Availability

The entire dataset supporting the findings of this study has been published in the article itself.