Fecha de recepción: 08-octubre-2021 Fecha de aceptación: 03 julio-2022

MEDICINAL PLANTS OF THE JOVÍ COMMUNITY, COLOMBIAN PACIFIC

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ABSTRACT

The Joví community, Colombian Pacific, is located in a geographically isolated region accessible only by boat. Considering its location in a global hotspot, its inhabitants are surrounded by high biodiversity, which favors its dependence on phytotherapeutic resources for health care. The present study aimed to identify the medicinal plant species of the region, their indications, forms of use and preparation, and to analyze if there is difference in medicinal plant knowledge between men and women. Data collection was made based on interviews (26 local experts), participant observation, and calculation of the relative importance of species. The data revealed the medicinal use of 77 species (39 families) to treat diseases related to 19 body systems. The family Lamiaceae showed the highest number of cited species, followed by Malvaceae and Asteraceae. There was no significant difference in knowledge about medicinal plants between men and women. Knowledge about medicinal plant resources in the Joví community is especially relevant to treat milder diseases. The signs and symptoms of COVID-19 are already recognized by the community, which uses the species *Gliricidia sepium* to treat the disease.

KEYWORDS: Ethnobotany, phytotherapeutic resources, traditional knowledge, traditional population.

LAS PLANTAS MEDICINALES DE LA COMUNIDAD JOVÍ, EN EL PACÍFICO COLOMBIANO

RESUMEN

La comunidad Joví, Pacífico colombiano, está ubicada en una región geográficamente aislada a la que solo se puede acceder por bote. Teniendo en cuenta su ubicación en un hotspot global, sus habitantes están rodeados de una alta biodiversidad, lo que favorece su dependencia de los recursos fitoterapéuticos para el cuidado de la salud. El presente estudio tuvo como objetivo identificar las especies de plantas medicinales de la región, sus indicaciones, formas de uso y preparación, y analizar si existe diferencia en el conocimiento de las plantas medicinales entre hombres y mujeres. La recolección de datos se realizó con base en entrevistas (26 expertos locales), observación participante y cálculo de la importancia relativa de las especies. Los datos revelaron el uso medicinal de 77 especies (39 familias) para tratar enfermedades relacionadas con 19 sistemas corporales. La

familia Lamiaceae presentó el mayor número de especies citadas, seguida de Malvaceae y Asteraceae. No hubo diferencias significativas en el conocimiento sobre plantas medicinales entre hombres y mujeres. El conocimiento sobre los recursos vegetales medicinales en la comunidad Joví es especialmente relevante para tratar enfermedades leves. Los signos y síntomas del COVID-19 ya son reconocidos por la comunidad, que utiliza la especie *Gliricidia sepium* para tratar la enfermedad.

PALABRAS CLAVE: Conocimientos tradicionales, etnobotánica, población tradicional, recursos fitoterapéuticos.

INTRODUCTION

The popular use of medicinal plants is considered a widespread tradition since the dawn of civilization (Silveira and Farias, 2009), being improved and supported through oral transfer over successive generations in traditional communities (Oliveira *et al.,* 2010). Over time, medicinal plants formed the basis to treat different diseases and are often highlighted in ethnobotanical studies (Varo-Rodríguez *et al.*, 2019).

Traditional populations located in isolated regions with limited access to doctors and healthcare facilities usually maintain traditions and customs for disease treatment, strengthening dependency and domain relationships over plant resources (Gomes and Bandeira, 2012; Göhre *et al*., 2016; Lautenschläger *et al*., 2018; ldm'hand *et al*., 2020). However, the maintenance of this transfer of traditional knowledge may be threatened by the new social, cultural, and economic organizations to which traditional populations could be submitted. (Silveira and Farias, 2009). Such changes have been observed in traditional farming communities (Gómez-Baggethun *et al*., 2010), riverine communities (Pasa and Ávila, 2010), and also in Afro-descendant communities (Crepaldi and Peixoto, 2010; Lisboa *et al*., 2017; Ordóñez *et al.*, 2018). Therefore, knowledge is not always preserved as it is often restricted to a small portion of the population or vulnerable to socio-environmental issues, such as high illiteracy rates among some of these populations (Heinrich *et al.*, 2006; Leonti, 2011).

Medicinal plant knowledge is influenced by factors such as age (Pasa and Ávila, 2010; Lisboa *et al*., 2017; Varo-Rodríguez *et al*., 2019), economic activity, access to education (Pandales, 2017), and gender (Cunha and Bortolotto, 2011; Silva *et al*., 2012). Regard to gender, studies show that women usually have more knowledge about medicinal plant use (Silva *et al.*, 2015; Lisboa *et al*., 2017; Pandales, 2017).

Populations nearby rainforests usually have access to important natural resources given the high biological diversity of this biome, gathering several potentially medicinal plant species (Rol *et al*., 2013). However, most rainforests are currently threatened, and show reduced and fragmented areas (Schäffer and Prochnow, 2002; Giraldi and Hanazaki, 2010). The rainforest in the Colombian Pacific is a global hotspot, highlighted by its highly threatened biological richness and for sheltering traditional populations that live and depend on plant resources for their survival (Mittermeier *et al.,* 2004; Ordóñez *et al*., 2018; Lima *et al.*, 2021).

In this scenario, our study focusses in the importance of medicinal plants to a traditional Afro-descendent community in the Colombian North Pacific (Joví community) and the relationship between their use and the maintenance of species biodiversity. Therefore, we aimed to survey the medicinal plant species in the region and identify their forms of use, indications, forms of preparation, how it is obtained, and in addition compare the knowledge in relation to gender. Considering that Joví is an isolated community in direct contact with the forest (Ordóñez *et al*., 2018), our hypotheses are a) the community is highly dependent on medicinal plants; and b) women have more knowledge about these plants and their uses.

MATERIAL AND METHODS

Study Area and Community. The study was developed in the Joví community, in the municipality of Nuqui, state of Chocó, Colombian Pacific (Figure 1), a region with high rainfall marked by the presence of rainforests (occupying 77% of the region), lack of dry periods, and ambient temperature ranging from 22 to 26 °C. These variables favors the occurrence of a great fauna and flora diversity in the region (Zuluaga and Ramírez, 2015) (Figure 2).

The community has 37.8 hectares, about 170 inhabitants (67 residences), mostly Afro-descendants (77.5%), while the remaining inhabitants are indigenous. The village is in direct contact with the forest, the river and the beach (Figure 2). Inhabitants use 135 plant species for various purposes, the most significant of which consist of medicinal, food, and technological use, respectively (Lima *et al*., 2021). In the last years, the community has changed the use of natural resources (and some ecosystem services - for details about the ecosystem services identified by the community see Ordonez *et al*., 2018), likely as due to changes in cultural patterns, such as the migration of young people to larger cities and changes in women's activities. The main economic activities are centered on agriculture, fishing, and tourism (Ordonez *et al*., 2018).

Data collection. This was a quali-quantitative exploratory study. Data collection techniques consisted of participant observation and semi-structured interviews using the "snowball" sampling technique (Bailey, 1994). Twenty-six interviewees considered local experts in the main economic activities were indicated by the community, with ages ranging from 27 to 59 years, 16 men and 10 women. The interviews had the objective of gathering data on the medicinal plants used, their indications, preparation techniques, and ways of obtaining them.

The plants indicated by the interviewees were collected during guided tours (Albuquerque *et al*., 2014), and the species that could not be collected were identified through photographs by different people from the community. The herborized plants were sent and deposited to the Herbarium of the Technological University of Choco (UTCH). Identifications followed the APG IV classification, and the scientific names were confirmed by the International Plant Names Index (https://www.ipni.org), Flora do Brasil Project https://floradobrasil.jbrj.gov.br/reflora/herbarioVirtual, and National University of Colombia (UNAL) (http://www.biovirtual.unal.edu.co/nombrescomunes/es/).

Ethical issues. Although not being mandatory in Colombia, we chose to request approval by the Ethics Council of the institution to which part of the authors are affiliated. The present study was then approved by the Human Research Ethics Committee (CEP) of the Center of Health Sciences of the Federal University of Paraíba (UFPB) under ethical protocol No. CAAE 56813716.4.0000.5188, and approved by the local ethnic authority, the General Community Council or *Los Riscales*. The interviewees were informed and clarified about the objectives of the study, after which they signed the Free Consent Form, as requested by the National Health Council through the Research Ethics Committee - Brazil (Resolution No. 196/96).

Data analysis. The information obtained on the medicinal plants was grouped according to the International Classification of Diseases of the World Health Organization (OMS, 2008). The Relative Importance Index (IR) (Bennet and Prance, 2000) was calculated to evaluate the relationship between plant use and the body systems indicated by the interviewees using the following equation: IR= NSC/NP, where NSC: number of body systems and NP: number of properties.

NSC is obtained by the equation: NSC= NSCE/NSCEV, where NSCE: number of body systems attributed to the species, and NSCEV: number of body systems attributed to the most versatile species. NP is obtained by the equation: NP=NPE/NPEV, where NPE: number of properties attributed to the species, and NPEV: number of properties attributed to the most versatile species.

The Mann-Whitney test was used to compare the knowledge between men and women, using the citation

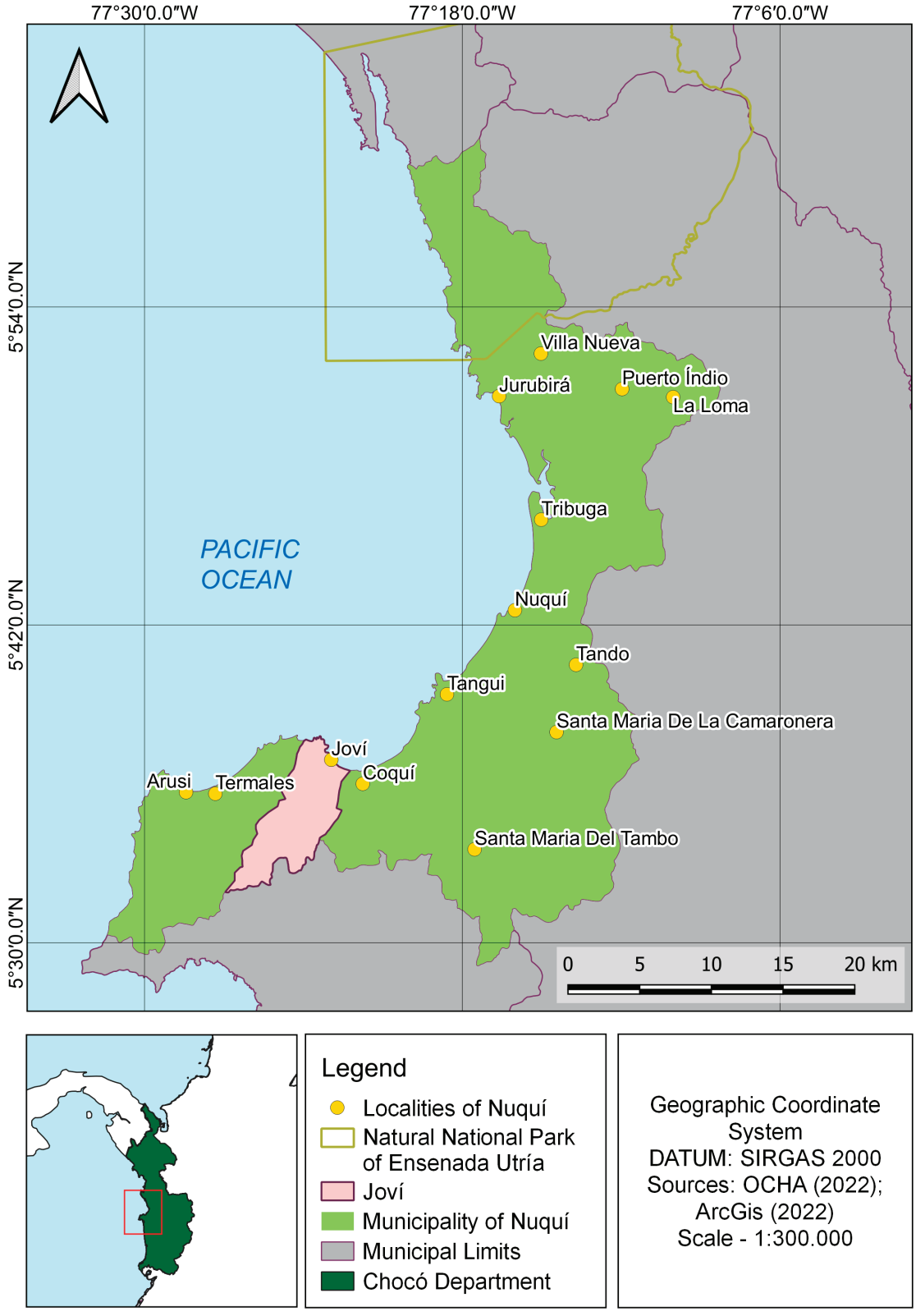

Figure 1. Geographical location of the municipality of Nuquí, its villages and limits with other municipalities and the Utria National Park. Source: Made by Ing. Freddy Carabaly AfroSig, Code 945, within the framework of the thesis to obtain a master's degree at the Federal University of Paraiba. Project: ecosystem services in forests and coasts in the Colombian Pacific and their interactions with the Afro-Colombian community: from risks to protection, 2016.

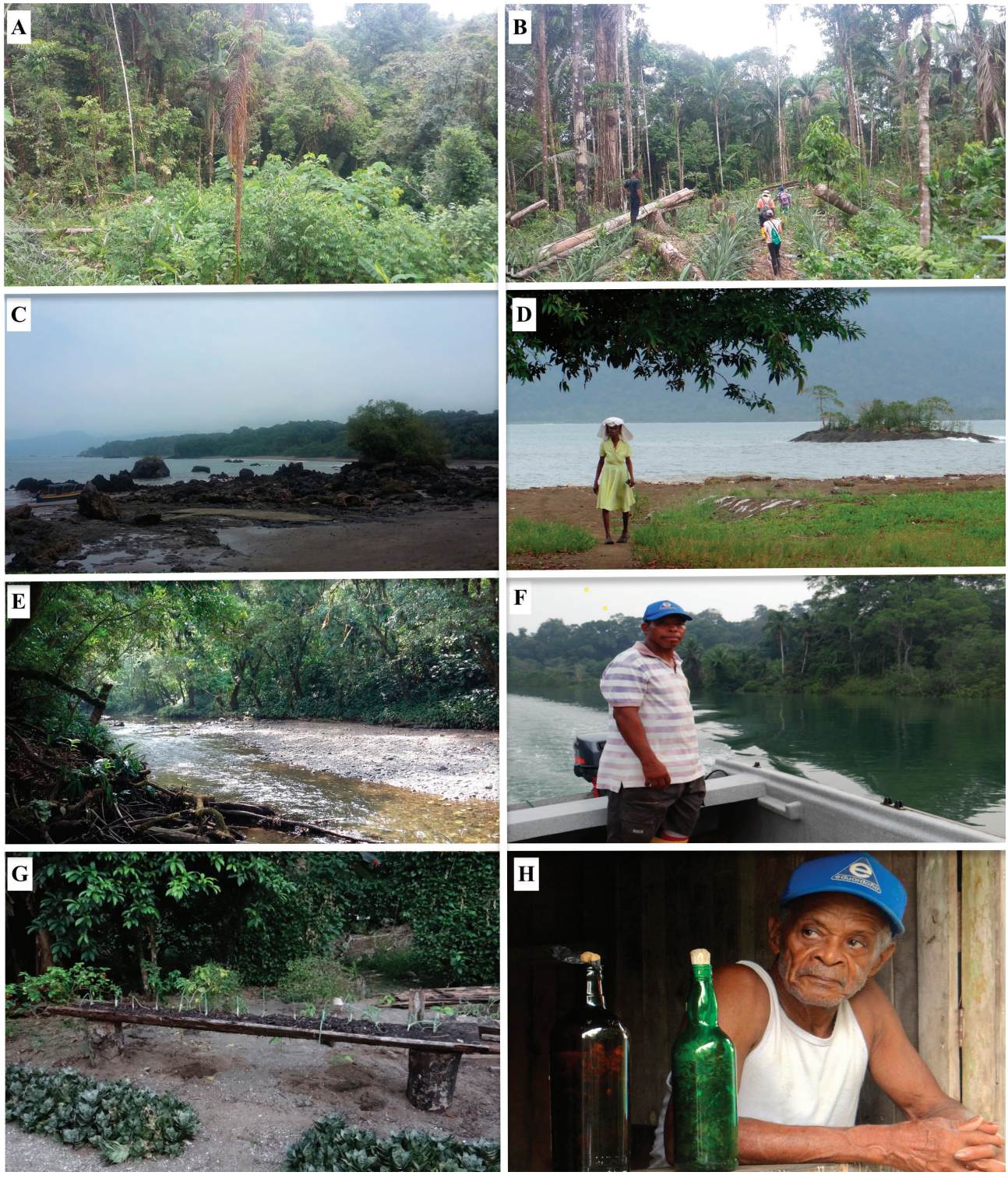

Figure 2. Ecological and sociocultural context of Jovi community in Nuqui State, Colombian Pacific. A) rainforest in Nuqui (in Spanish, '*Monte bravo o selva*'); B) *Fincas*: spaces within the forest where families produce and grow basic subsistence products; C) the beach or coastal ecosystems (in Spanish '*Playas*'): spaces in low-lying areas known as *bajos* (here populations find animal protein derived from different crustaceans and molluscs). Coconut trees are also cultivated in this place, symbol of the territorial occupation of the locals. It is also a transit point that connects the different communities; D) a local Afro-descendent woman on the beach near the Jovi village; E) the Jovi River, that is very important to the community; F) a local Afro-descendent fisherman; G) *Zotea*: traditional homemade vegetable garden (where many medicinal and seasoning are growing); H) Medicinal bottled prepared with cultivated and wild plants.

number between genders by species. This test was used because the data did not show a normal distribution. The test was performed with the software Biostat 5.3 (Ayres *et al*., 2007).

RESULTS AND DISCUSSION

We identified 77 medicinal plant species (39 families). However, two species could not be identified (Table 1). Many plant families showed low representativeness of species (24 families had only one representative species). The families Asteraceae and Lamiaceae (7 species each one) showed the highest number of cited species, followed by, Malvaceae and Fabaceae. The diversity of bioactive compounds in these families may justify their high incidence of use (Amri and Kisangau, 2012) and frequent indications to treat diseases related to several body systems. Asteraceae was also highlighted in the medicinal category of other studies conducted in rainforest regions around the world (Giraldi and Hanazaki, 2010; Meyer *et al*., 2012), including studies with Afro-descendant communities (Silva *et al.*, 2012; Lisboa *et al*., 2017).

The most cited medicinal species were *Gliricidia sepium* (matarratón), *Solanum incomptum* (sauco), and *Rollinia danforthii* (guasimo blanco). *Gliricidia sepium* is used to treat flu symptoms, fever, headache, infections, and malaria by the Joví population, also being used to treat the symptoms of coronavirus infection (COVID 19), according to the recommendations of local experts. This species is more often used for disease treatment in the Caribbean region of Colombia (Gómez-Estrada *et al*., 2011), and its diversity of use is known over the entire Colombian region (Paniagua-Zambrana *et al*., 2020). The use of this species deserves special attention given its importance to the community (it is used for medicinal and fuel purposes); however, the cultivation practice of this species reduces the impact of the extractivism and contributes to its conservation (Lima *et al.*, 2021).

The identified plants were used to treat diseases related to 19 body systems according to the International Classification of Diseases of the World Health Organization (ICD, 2012). The highlighted categories were: infectious and parasitic diseases (31 species), respiratory system diseases (15 species), and diseases related to pregnancy, childbirth, and the puerperium (14 species) (Table 1). This result is similar to those found among various traditional populations in Brazil, especially with regard to respiratory and digestive system diseases (Cunha and Bortolotto, 2011; Meyer *et al*., 2012; Brito *et al.*, 2015; Silva *et al*., 2015; Ávila and Pasa, 2018). The use of medicinal plants to treat respiratory diseases was also highlighted in traditional Mexican communities (Varo-Rodríguez *et al*., 2019) and in an isolated and hardly accessible community in Madagascar (Riondato *et al*., 2019). Common and less severe diseases involving the respiratory and digestive systems are more easily treated with medicinal plants (Vitalini *et al*., 2013; Lautenschläger *et al*., 2018), especially for manifesting easily identifiable symptoms (Beltreschi *et al*., 2019) and given the precarious sanitary conditions (Almeida *et al*., 2006).

The wide use of medicinal species to treat respiratory diseases may also justify the high representativeness of the family Lamiaceae as its species are mainly used to treat flu and cold symptoms (Silva *et al*., 2012).

The community prepare the plants to use in different ways: 39 species are used in baths, 22 are used in infusions, 16 are used for bottled preparations, and the others are used as follows: tea (14 species), ground plant parts (11 species), poultice (11 species), soaked in water (10 species), and *in natura*, which means consumed without any change (2 species). Many species show high versatility (41.18% have more than one form of use) (Table 1). It is important to highlight the use of the species *Saccharum officinarum* (Poaceae), popular called caña de azúcar, that is not indicated to treat a specific disease; however, it is used to prepare a liquor (locally called '*viche*'), which is the base of bottles and lickers. It can be drunk or applied to the skin, depending on the plant combination and the disease that must be treated.

The noticeable use of plant species to prepare baths was also reported for another community in the same State (Chocó) (Pandales, 2017). Herbal baths are popular in

Table 1. Medicinal plants used by the Joví community, with its common names, body systems (BS), indication of use (I), preparation (FP), relative importance (RI), obtained way (P - planted/ E - extarctivism) and number of citations by men and women. Forms of preparation: T = tea, B = bath, BO= bottled, I = infusion, IN = in natura, Sa= soaked in water, G= grinded, P= plaster. Body systems: 1 - diseases related to pregnancy, childbirth, and the puerperium, 2 - diseases of the genitourinary system, 3 - circulatory system diseases, 4 - infectious and parasitic diseases, 5 – neoplasm, 6 - immune system diseases, 7 - symptoms, signs and abnormal clinical and laboratory examination findings, not classified elsewhere, 8 - diseases of the skin and subcutaneous tissue, 9- injuries, poisonings and some other consequences of external causes, 10 - digestive system diseases, 11 - blood and hematopoietic organ diseases, 12 - respiratory system diseases, 13 - osteomuscular and connective tissue diseases, 14 – nervous system disease, 15 - mental and behavioral disorders, 16 - diseases of the ear and mastoid process, 17 - endocrine, nutritional and metabolic diseases, 18 - diseases of the eye and appendages, 19 – not definied diseases.

FAMILY	SCIENTIFIC NAME	COMMON/ LOCAL NAME	BS	I	FP	RI	P/E	MALE CITATIONS	FEMALE CITATIONS
Acanthaceae	*Trichanthera gigantea* Humb. & Bonpl. ex. Steud.	Nascedera	1	Childbirth	I	1.00	P	1	2
	Justicia sp.	Riñonera	2	Kidneys	B, I	1.00	P	1	0
Amaranthaceae	*Alternanthera lanceolata* Schinz	Descansé	3; 4	High blood pressure, typhoid fever	B, Sa	1.00	P	1	0
	Chenopodium ambrosioides Bert ex. Steud	Paico	4; 5	Parasites, cancer	BO	1.00	P	2	4
Amaryllidaceae	*Allium sativum* L.	Ajo	4; 2	Parasites, bottled preparations for women	BO	1.00	P	1	0
	Allium cepa L.	Cebolla, cebolla de rama	1; 2	Childbirth, bottled preparations for women	BO, I	1.00	P	1	6
Anacardiaceae	*Spondias mombin* Jacq.	Ovo	1; 4	Childbirth, anti-tetanus	B	1.00	E/P	1	0
Annonaceae	*Annona muricata* L.	Guanábana	5; 6	Cancer prevention, strengthen the immune system	I	1.00	P	1	0
	Rollinia danforthii Standl.	Gúasimo blanco	4; 7; 8	Fever, malaria, headache, baldness	T, B	0.75	E	6	3
Araceae	*Monstera adansonii* Schott	Costilla de Adán	4; 9	Parasites, snake poison, malaria	B, P, IN, BO	0.66	E	3	1
Arecaceae	*Cocos nucifera* L.	Coco	4; 10	Colic, infections, stomachache	Sa	0.66	P/E	1	1
Aristolochiaceae	*Aristolochia cordiflora* Mutis ex. Kunth	Zaragoza	9; 10	Flatulence, snake bite	BO, B	1.00	E	1	1

Table 1. Cont.

FAMILY	SCIENTIFIC NAME	COMMON/ LOCAL NAME	BS	I	FP	RI	P/E	MALE CITATIONS	FEMALE CITATIONS
	Artemisia sodiroi Hieron.	Alhucema	1; 2	Bottled preparations for women, child navel healing	BO, G	1.00	P	1	3
Asteraceae	*Sphagneticola trilobata* (L.) Pruski	Botoncillo	11	Liver	B, Sa	1.00	E	1	1
	Adenostemma platyphyllum Cass.	Doña juana	9	Snake bite	BO	1.00	P	3	0
	Pseudelephantopus sp.	Consuelda, chicoria	7; 8	Inflammations, baldness	B	1.00	P	2	1
	Achillea millefolium L.	Hierba di carpintero	1; 9; 10	Flatulence, childbirth, snake bite	BO, G	1.00	E/P	1	2
	Ageratum conyzoides Sieber ex. Steud.	Hierba de chiva	12	Flu	B	1.00	E	0	2
	Neurolaena lobata R.Br.	Venadillo	4; 10; 9	Malaria, liver, snake, scorpion, and conga ant bite	T, BO	1.00	E	1	1
Bignoniaceae	*Jacaranda hesperia* Dugand	Tunisco	13	Rheumatism	I, P	1.00	E	1	2
Boraginaceae	*Varronia spinescens* (L.) Borhidi	Verde negro	8; 4; 13	Cellulitis, inflammations, bones	B	1.00	E	2	2
Chloranthaceae	*Hedyosmum scaberrimum* Standl.	Rodilla de polho, rodillon	2	Kidneys	T	1.00	E	0	1
Cornelinaceae	*Tripogandra serrulata* (Vahl) Handlos	Siempre viva	12; 4	Flu, typhoid fever	P, B, T	1.00	E	2	0
Crassulaceae	*Bryophyllum pinnatum* Kurz	Hierba santa	7; 8; 12	Pain, cellulitis, shortness of breath	B, T	1.00	E/P	0	2
Cyperaceae	*Kyllinga odorata* Liebm.	Espadilla	4	Typhoid fever	B	1.00	E	1	0
Erythroxylaceae	*Erythroxylum coca* Lam.	Coca	4; 14	Nerves and diarrhea	I	1.00	E/P	1	0

Table 1. Cont.

FAMILY	SCIENTIFIC NAME	COMMON/ LOCAL NAME	BS	I	FP	RI	P/E	MALE CITATIONS	FEMALE CITATIONS
Fabaceae	*Senna reticulata* (Willd.) H.S.Irwin & Barneby	Galve	10	Stomach	T	1.00	E	0	2
	Gliricidia sepium Kunth	Matarratón	4; 7; 12	Flu, fever, headache, infections, malaria, coronavirus symptoms.	B, I	0.50	P	8	3
	Andira inermis (W.Wright) Kunth ex DC.	Amargo	4	Typhoid fever	B	1.00	E	1	0
	Lens culinaris Medik.	Lenteja	1	Childbirth	BO	1.00	P	0	1
	Senna occidentalis (L.) Link	Potra	4; 10	Parasites, stomachache	I, B	1.00	P	2	2
Phytolaccaceae	*Phytolacca bogotensis* Kunth	Guaba	1	Childbirth	B	1.00	E	0	1
Gesneriaceae	*Drymonia killipii* Wiehler	Desbaratadora	2	Kidneys	B, P	1.00	E	1	0
	Saintpaulia ionantha H.Wendl.	Violeta	12	Flu	T, B	1.00	P	0	1
Heliconiaceae	*Heliconia psittacorum L.f.*	Heliconia	12	Asthma	G	1.00	E	3	0
Lamiaceae	*Scutellaria pseudocoleus* Fern.Alonso	Albacón	2; 10	Stomach and vaginal infections	B	1.00	P	0	1
	Lepechinia sp.	Albahaca blanca	4	Parasites	BO, B	1.00	P	1	0
	Hyptis sp.	Toronjil	3; 14	Stress, tachycardia	I	1.00	P	0	1
	Ocimum campechianum Chapm.	Albahaca	1; 2; 15	Childbirth cleaning, vaginal wash, disorientation.	B	1.00	P	1	0
	Clinopodium brownei (Sw.) Kuntze	Poleo	12; 1	Flu, childbirth	I	1.00	P	0	3
	Origanum vulgare L.	Orégano	14; 16	Tranquilizer, earache	I	1.00	P	0	2
	Rosmarinus officinalis L.	Romero	1	Child navel healing	BO	1.00	P	0	2
Lauraceae	*Persea americana* Mill.	Aguacate	14; 17	High cholesterol levels, dizziness	I; IN	1.00	P	0	1

Table 1. Cont.

FAMILY	SCIENTIFIC NAME	COMMON/ LOCAL NAME	BS	I	FP	RI	P/E	MALE CITATIONS	FEMALE CITATIONS
Malvaceae	*Hibiscus rosa-sinensis* L.	Papo, resucito, san joaquin	4; 8	Fever, skin rash	B, G	1.00	E	4	3
	Ochroma pyramidale (Cav. Ex Lam.) Urb.	Balso	4; 7	Fever, headache	G	1.00	E	3	1
	Sida rhombifolia L.	Escobabosa	2; 8	Acne, colic	B, G, P	1.00	E/P	1	2
	Luehea seemannii Planch. & Triana	Guásimo colorado	4; 7; 8	Fever, malaria, headache, baldness	B	0.75	E	4	0
	Taliparitiliaceum (L.) Fryxell	Majaguo	9; 12	Stingray sting, flu, asthma	Sa	0.66	E	1	0
	Malachra alceifolia Jacq.	Malva	12; 2; 14	Flu, kidneys, tranquilizer	G, B, I	1.00	P	0	3
Melastomataceae	*Nepsera aquatica* Naudin	Cana agria	4	Parasites	I, BO	1.00	E/P	1	2
Myrtaceae	*Psidium guajava* L.	Guayabo	1; 4; 10	Childbirth, diarrhea, stomach	T, B, I	1.00	P	1	2
	Myrcia sp	Arrayán	13	Bone pain	B	1.00	P	1	0
Moraceae	*Ficus maxima* Mill.	Higuéron	4	Parasites	T	1.00	E	3	0
Musaceae	*Musa* sp.	Guineo pajarito	4; 6	Typhoid fever, strengthen the immune system	B, G	1.00	P	1	0
Petiveriaceae	*Petiveria alliacea* L.	Anamú	1; 13; 5; 19; 3; 9	Childbirth, rheumatism, pain, blood circulation, cancer prevention, snake bite	B, I, G, Sa, P	1.00	P	0	23
Piperaceae	*Piper* sp1.	Celedonia	1; 8	Cellulitis, childbirth	I	1.00	P	0	1
	Piper sp2.	Coronillo	2; 4; 18	Eye diseases, fever, kidneys	B, BO	1.00	E	1	3
	Piper peltatum L.	Santa Maria de aniz/ Santa Maria boba	4; 13; 12	Some infectious and parasitic diseases, Bone pain, flu	B, BO, Sa, P.	1.00	E	6	3

Table 1. Cont.

FAMILY	SCIENTIFIC NAME	COMMON/ LOCAL NAME	BS	I	FP	RI	P/E	MALE CITATIONS	FEMALE CITATIONS
Plantaginaceae	*Scoparia dulcis* L.	Escubilla	4	Parasites	B	1.00	E	0	1
	Conobea scoparioides Benth.	Hierba de sapo	10	Bellyache	B, T	1.00	E	1	0
	Plantago major L.	Llanten/ Amaranto	3; 12; 16	Heart diseases, high blood pressure, asthma, earache	I, Sa	1.00	P/E	0	4
Poaceae	*Cymbopogon citratus* Stapf	Limoncillo	12	Flu	T	1.00	P	1	0
	Zea mays L.	Maiz	1; 14; 13	Childbirth, tranquilizer, broken bones	I	1.00	P	6	2
Portulacaceae	*Talinum paniculatum* (Jacq.) Gaertn.	Verdolaga	8	Cellulitis	B, I	1.00	E	0	1
Rubiaceae	*Gonzalagunia ovatifolia* B.L.Rob.	Palito x	8; 9	Cellulitis, snake bite	B, P	1.00	E	1	2
	Psychotria poeppigiana Müll.Arg.	Sombrerito del diablo	4	Typhoid fever	B	1.00	E	1	0
	Borojoa patinoi Cuantec.	Borojó	8	Cellulitis	P	1.00	P	0	1
	Morinda citrifolia L.	Noni	13	Joints	P	1.00	P	0	1
Simaroubaceae	*Simaba cedron* Planch.	Cedrón	4; 9	Snake bite, parasites, malaria	BO, Sa	0.66	E	3	1
Solanaceae	*Solanum incomptum* Bitter	Sauco	4; 10; 18	Malaria, diarrhea, stomach, conjunctivitis	T, Sa, B	0.75	P	7	3
Urticaceae	*Urera caracasana* (Jacq.) Gaudich. ex Griseb.	Pringamosa	7	Vomiting	G	1.00	E	0	1
Verbenaceae	*Lippia alba* (Mill.) N.E.Br. ex Britton & P.Wilson	Prontoalivio	4	Diarrhea	I	1.00	P	1	1
Xanthorrhoeaceae	*Aloe vera* L.	Sábila	7	Headache	P	1.00	P	0	2
Zingiberaceae	*Hedychium coronarium* J.Koenig	Hilotropio, otropio	2; 12	Vaginal and lung infections	I, B	1.00	E	2	0
	Zingiber officinale Roscoe	Jengibre, ajenjibre	2; 12	Flu, menstrual cramps	T, Sa	1.00	P	1	0
Indeterminate	Indeterminate	Biande	4; 7	Fever, headache	G	1.00	P	1	0
Indeterminate	Indeterminate	Hierba de espanto	12; 15	Disorientation, lungs, flu	T	0.66	E	0	1

Afro-descendant communities for spiritual and healing purposes, the latter of which is often used to treat fevers (Pires *et al*., 2009; Philander, 2011). This association between mystic/religious and medicinal purposes was evidenced when the interviewees sometimes struggled to distinguish between both uses, demonstrating that the physical symptoms of some diseases could have a spiritual nature, such as the "evil eye" (in Spanish "*aojo*"). This association between magic/mysticism and healing is often inseparable (Caballero-Serrano *et al*., 2019; Kawa, 2012). Medicinal plants used to heal "evil eye" symptoms are highly important for Afro-descendant communities, and for this reason, they were transferred to the mystical/religious category (Crepaldi and Peixoto, 2010).

There is little difference between the species obtained by extractivism (41.55%) and cultivated plants (48.05%) in the community (Table 1). The medicinal plants obtained by both ways account for 6,16% of the total. Of the 77 listed species, one is considered data-deficient (*Hedychium coronarium* J.Koenig) and 21 are listed as least-concern on the IUCN Red List (IUCN Red List, https://www.iucnredlist.org/). The least-concern category includes evaluated species which are not considered in any endangered category (IUCN Red List, https://www.iucnredlist.org/). The use of *Hedychium coronarium* deserves more attention due to lack of distribution and/or population information, thus it is not possible to define a real category (IUCN Red List, https://www.iucnredlist.org/). Half of the species used by Joví community is planted and the absence of endangered species favors the community to continue using medicinal plants in the treatment of diseases. The community has a closer relationship with these plants and recognize their importance for the community health.

There was no significant difference between the number of citations per species among men and women (U = 4.124.00; p = 0.3825), suggesting that both genders have similar knowledge about species use. This result may imply that medicinal plant knowledge is well distributed among the genders, mainly because the study was conducted to the community specialists. The close contact of people with nature, especially with regard to the extraction of plant resources for medicinal purposes, is a noticeable feature in traditional communities isolated from urban centers. Isolation favors the dispersion of knowledge in the community as the individuals have more contact with each other and depend on this environment for their survival, reflecting the reality of some Afro-descendant communities (Göhre *et al.*, 2016; Lautenschläger *et al.*, 2018). Other important factors are the proximity of these communities to forest areas and the high diversity of local plants, facilitating their collection, which is also observed in the Kimboza Forest Reserve, a region rich in endemic species (Amri and Kisangau, 2012).

The homogenous distribution of medicinal plant knowledge in the Joví community differs from other Northern Pacific communities, where men showed less knowledge about medicinal plants (Gómez-Estrada *et al.*, 2011; Pandales, 2017). This difference may be related to the size of the communities compared as the Joví community population, on average, (Gómez-Estrada et al., 2011; Pandales, 2017) accounts for only 10% of the other two communities, and the transmission of traditional knowledge may occur more effectively in smaller communities. Another important factor is related to the sampling method, which in this study was the snowball technique by selecting local experts, differing from the other studies mentioned above, in which a random sample of the population was selected.

CONCLUSIONS

The Joví community has a close relationship with plant resources for medicinal purposes, justified by its isolated geographic location and the proximity to plant resources. Knowledge is well distributed among men and women, who report treating infectious, parasitic, and respiratory diseases very often. It is worth noting that the Joví community recognizes the symptoms of COVID-19 and uses the species *Gliricidia sepium* to treat the signs and symptoms that they associate with this new virus.

The important role of traditional knowledge in the use of medicinal plants should be recognized as this is the

only health treatment option for several people in the community. Since the community does not have access to regular medical care, it would be interesting to consider establishing a green pharmacy supported by local experts and professionals (doctors and/or other health professionals) in order for the community to establish protocols for the use of certain species in particular situations. The green pharmacy is an already adopted initiative in some cities/countries around the world and constitutes a very effective health care strategy related to the conservation of the biological and cultural heritage (Shivakumar *et al.*, 2013; Fonseca *et al.*, 2020).

ACKNOWLEDGEMNTS

We thank the Joví community. The data presented here are part of the Master's dissertation of DVTL in the Development and Environment Postgraduate Program of UFPB / Brazil, and the data were collected during the development of Project Pacifilia. LLO received a master's scholarship from the Coordination for the Improvement of Higher Education Personnel (CAPES – Financing Code 001).

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