Research article

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Knowledge and use of medicinal plants in high mountain areas of the department Cundinamarca, Colombia

Conocimiento y uso de plantas medicinales en zonas de alta montaña del departamento Cundinamarca, Colombia

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Abstract:

Background and Aims: High mountain ecosystems in Colombia provide essential services but are subjected to strong anthropogenic pressures. Ensuring their conservation requires integrating local biodiversity knowledge, although significant gaps remain, particularly regarding the use of medicinal plants. This study aimed to investigate knowledge associated with the use of medicinal plants among peasant communities in a high mountain region of the department Cundinamarca, in the Eastern Cordillera of Colombia.

Methods: Semi-structured and structured interviews were conducted, complemented by free-listing and guided tour techniques. Botanical specimens were collected, herborized and deposited in the HPUJ and COL herbaria. Reported ailments and diseases were grouped according to the International Classification of Primary Care-3 (ICPC-3) of the World Health Organization. The Informant Consensus Factor (ICF) and Relative Importance (RI) indices were calculated.

Key results: A total of 159 taxa were recorded, of which 99 were native and 60 introduced. The most representative botanical families were Asteraceae and Lamiaceae, notable for their species richness and therapeutic properties. A total of 2063 use reports were recorded, of which 832 corresponded to native species and 1231 to introduced species; the latter were more widely used due to their accessibility and therapeutic versatility. The main ailments treated included digestive system disorders (ICF=0.89), respiratory conditions (ICF=0.86), and skin diseases (ICF=0.86).

Conclusions: Only 23.6% of the recorded species are included in the national list of medicinal plants authorized for phytotherapeutic products, highlighting the need for further phytochemical and pharmacological research. The findings also emphasize the importance of conserving local knowledge and promoting the sustainable use of medicinal plants in this region, particularly native species, which face challenges related to their availability and conservation due to environmental restrictions.

Key words: Andean region, ethnobotany, local knowledge, rural communities, therapeutic uses.

Resumen:

Antecedentes y Objetivos: Los ecosistemas de alta montaña en Colombia proveen servicios esenciales, pero enfrentan fuertes presiones antrópicas. Para asegurar su conservación es fundamental integrar el conocimiento local de la biodiversidad, aunque persisten vacíos, especialmente en el uso de plantas medicinales. El objetivo de este estudio fue investigar el conocimiento asociado al uso de plantas medicinales en comunidades rurales de una región de alta montaña del departamento de Cundinamarca, en la Cordillera Oriental de Colombia.

Métodos: Se aplicaron entrevistas semiestructuradas y estructuras, junto con las técnicas de listas libres y recorridos guiados. Se recolectaron especímenes botánicos, los cuales fueron herborizados y depositados en los herbarios HPUJ y COL. Las dolencias o enfermedades reportadas fueron agrupadas con base en the International Classification of Primary Care-3 (ICPC-3) of the World Health Organization. Se calcularon los índices de Factor de Consenso de Informantes (FCI) e Importancia Relativa (IR).

Resultados clave: se registraron 159 taxones, de las cuales 99 son nativos y 60 introducidos. Las familias más representativas fueron Asteraceae y Lamiaceae, destacando por su diversidad de especies y propiedades terapéuticas. Se registraron 2063 informes de uso, de los cuales 832 fueron para especies nativas y 1231 para especies introducidas; estas últimas son más utilizadas debido a su accesibilidad y versatilidad terapéutica. Las principales dolencias tratadas incluyen problemas del sistema digestivo (FCI=0.89), respiratorio (FCI=0.86) y cutáneo (FCI=0.86).

Conclusiones: el estudio evidenció que solo 23.6% de las especies registradas están incluidas en el listado nacional de plantas medicinales para productos fitoterapéuticos, lo que resalta la necesidad de más estudios fitoquímicos y farmacológicos. Además, se destaca la importancia de conservar el conocimiento local y promover el uso sostenible de las plantas medicinales, especialmente las nativas, que enfrentan desafíos relacionados con su disponibilidad y conservación debido a restricciones ambientales.

Palabras clave: comunidades rurales, conocimiento local, etnobotánica, región Andina, usos terapéuticos.

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Introduction

The high mountain zone in Colombia encompasses the geographical space corresponding to elevational peaks of the Andean mountain ranges, starting approximately from 2700 m above sea level. This region includes the upper limit of the Andean forest, the high Andean forest belt, and the paramo (Sarmiento et al., 2013; 2017). These ecosystems provide services such as water regulation, carbon storage, and biodiversity conservation (Hofstede et al., 2003; Diazgranados et al., 2021). However, paramos and high Andean areas have undergone intense changes due to pressures induced by anthropogenic activities (Hofstede et al., 2003; Vargas and Pedraza, 2004; Morales et al., 2007; Rivera-Ospina and Rodríguez-Murcia, 2011; Vásquez Cerón and Buitrago, 2011; Sarmiento et al., 2013; Diazgranados et al., 2021).

Ensuring the conservation of biota, soil, and ecosystem services in these ecosystems is therefore essential. This includes promoting the sustainable management of species and landscape diversity, as well as supporting the diverse uses of natural resources and the low-intensity agricultural systems that are part of the traditions of the inhabitants of this region (Hofstede et al., 2003; Varela, 2008; Cortés-Duque and Sarmiento, 2013). Some of the causes of the degradation of these ecosystems are considered to be the loss of cultural richness and the absence of strategies that integrate the knowledge of peasant communities with technological developments to ensure their survival without causing profound ecosystem transformations (Hofstede et al., 2003). However, although the ongoing transformations in these environments are recognized, research documenting the knowledge associated with the specific flora diversity of this region remains scarce (Manrique-Abril and Manrique-Abril, 2006; Burbano Martínez, 2010; Zusunaga Quintana et al., 2011; Galvis Rueda and Torres Torres, 2017; Alcántara Rodríguez et al., 2018; Torres-Orozco, 2018), particularly regarding medicinal plant knowledge (González et al., 2001; Toscano González, 2006; Pérez and Matiz-Guerra, 2017; Galvis Rueda and Torres Torres, 2017; Alcántara Rodríguez et al., 2018).

The objective of this study was to investigate the knowledge associated with the use of medicinal plants among peasant communities in a high mountain region of the department Cundinamarca, in the Eastern Cordillera of Colombia, as a regional inventory; therefore, no comparative analysis among the different paramo complexes was performed. Specifically, the study aimed to address the following questions: 1) which plants are used as medicines by the peasant communities of the region? and 2) are there differences in the knowledge and use of medicinal plants based on whether they are native or introduced?

Based on the versatility hypothesis — which posits that people are more likely to retain knowledge and use plants with a greater number of applications — and considering that exotic plants have been included in pharmacopoeias due to their versatility and their likelihood of being selected and carried by immigrants to various regions (Bennett and Prance, 2000; Leal Alencar et al., 2010), it was predicted that peasant communities in this region demonstrate greater knowledge and more frequent use of exotic medicinal species than of native species of the high Andean region.

Material and Methods

Study area

This research was conducted in collaboration with rural peasant communities residing in high mountain areas associated with four paramo complexes situated in the department Cundinamarca, within the Eastern Cordillera of Colombia (Fig. 1). The first zone encompasses the Chingaza Paramo Complex and includes rural communities from the municipalities of Choachí, Fómeque, and Guatavita, spanning elevations between 2580 and 3220 m a.s.l. (Fig. 1). The second zone comprises the territories surrounding the Cruz Verde Paramo, situated in the municipalities of Choachí, Ubaque, and Chipaque, ranging from 2970 to 3110 m a.s.l. The third zone encompasses the areas surrounding the Guerrero Paramo, located in the municipality of Cogua, with elevations ranging between 2805 and 3400 m a.s.l. Lastly, the fourth zone corresponds to the territories surrounding the Guacheneque Paramo in the municipalities of Villapinzón and Machetá, with elevations ranging from 2656 to 3300 m a.s.l. (Fig. 1). The map presented in figure 1 illustrates the geographic distribution of the study sites and serves to define the regional scope of the research.

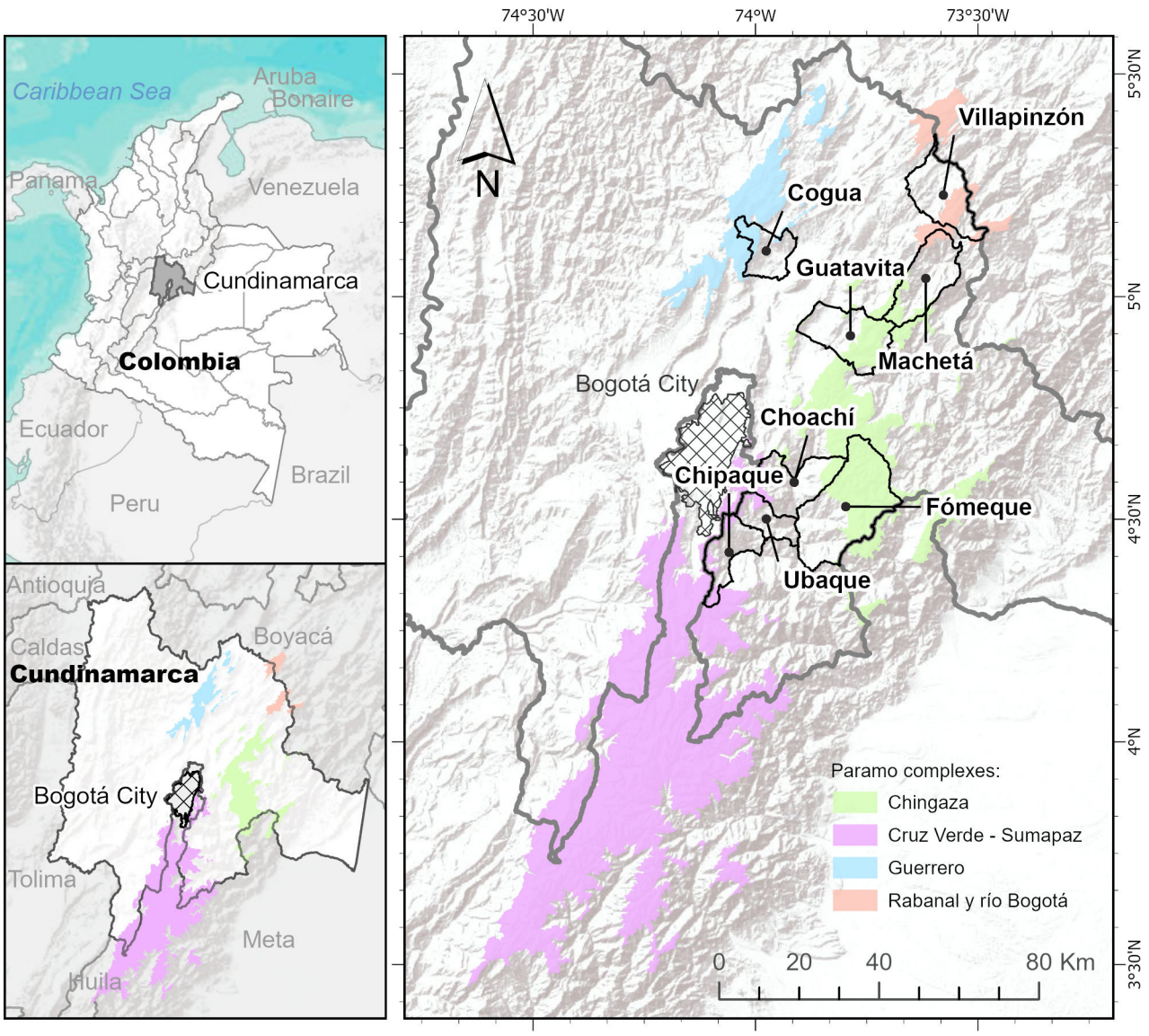

Figure 1: Paramo complexes and municipalities where the study was conducted, department Cundinamarca, Colombia.

The rural communities inhabiting this high Andean region of Cundinamarca share a common historical and cultural heritage dating back to pre-Hispanic times (Gamboa Mendoza, 2015; Bejarano et al., 2022; Argüello García, 2023). Before the Spanish conquest, this region was inhabited by the Muisca indigenous population (Argüello García, 2020). Their medical specialists, known as jaques or shamans, were persecuted by Europeans, and by the 19th century had disappeared along with their associated medicinal and religious institutions (Zuluaga et al., 2022). Nevertheless, certain practices, particularly those associated with the use of medicinal plants, have persisted to the present day (Zuluaga et al., 2022). In this region, therapeutic practices are generally understood through the lens of active medical pluralism. Alongside indigenous medicine, other systems such European and Asian medicine and homeopathy have been incorporated. Within this context, the use of medicinal plants remains a cornerstone of primary healthcare through practices such as baths, poultices, and infusions (Garzón-Forero, 2019).

At present, the local economy revolves around agriculture and livestock production (Morales et al., 2007; Gómez-Latorre et al., 2021; Bejarano et al., 2022). Moreover, portions of the high-mountain ecosystems in this territory

are protected under national or regional reserve designations, given the importance of the ecosystem services they provide, particularly water supply for the major urban centers of the Bogotá Savanna (obs. pers.).

Data collection

This research was conducted with the approval of the Research and Ethics Committee of the Pontificia Universidad Javeriana (Project ID 20041). To establish a relationship of trust with the rural communities surrounding the four paramo areas, a process of direct contact was carried out between 2021 and 2022 to inform them about the purpose of the research and to receive their feedback. The process continued with those inhabitants who agreed to participate, for whom informed consent was obtained prior to the interview. Likewise, permission was requested to record the conversations; when such permission was not granted, notes were taken of all contributions.

Data collection began with an individual semi-structured interview to record information on the socio-economic profile of the informant. The "free list" technique (Albuquerque et al., 2014) was then employed to record the plants known by each participant, using the guiding question "Which medicinal plants from this area do you know?" To complement the information provided by the informant, the complete list was read back to the informant to review and add any plants that the informant may have possibly forgotten. Subsequently, a structured interview was conducted inquiring about the use of each mentioned plant, including therapeutic action, part used, preparation method, and other usage conditions. Participants were also asked about their lifetime and recent usage of the plant, as well as its prevalence in the environment and related conservation aspects.

A total of 119 inhabitants agreed to participate: 68 women and 51 men. Participants' ages ranged from 15 to 88 years. Most had completed primary or secondary education (113 individuals), with only two reporting no formal education and four having technical or professional training. As is typical among inhabitants of this region, the majority were engaged in agricultural or livestock-related activities (71 individuals) or domestic work (30 individuals); six participants were employed as park rangers in nearby protected areas, while the remaining participants worked in other occupations such as commerce. Most informants were either native to the region or had lived there for many years, whereas those who had migrated generally came from neighboring municipalities.

For the botanical identification of the plants mentioned in the free list, the "guided tour" technique (Albuquerque et al., 2014) was employed, in which the informant assisted in the collection of the mentioned plants. Photographs were taken with a Nikon camara (D3200, Tokyo, Japan) and specimens for the collected plants were herborized. It is important to emphasize that the study did not include medicinal plants exclusively obtained from markets, such as cinnamon, ginger, lemon, or papaya. Plant collection was conducted under the framework permit for the collection of wild specimens from the Pontificia Universidad Javeriana. For participants who did not accept or were unable to conduct the guided tour, a second phase was carried out in which the collected specimens were presented with other informants from the community, and photographs were shown to corroborate the plant mentioned in the list.

The collected specimens were processed and subsequently identified at the Colombian National Herbarium (COL). Specimens were deposited at the Herbario de la Pontificia Universidad Javeriana (HPUJ) and the Herbario Nacional Colombiano (COL). Acronyms of the herbaria follow Thiers (2025).

The identified plants were classified into different categories. Firstly, their biogeographical origin was considered, dividing them into native or exotic, using the Catalog of Plants and Lichens of Colombia as a reference (Bernal et al., 2019). Next, their management within the community was considered, classifying them as cultivated or wild. Finally, they were categorized according to growth habit, distinguishing among trees, shrubs, rosettes, herbs, subshrubs, and climbers.

Data analysis

During the interviews, the symptoms or illnesses treated with medicinal plants were first recorded using the local

terms reported by the informants. Subsequently, these reports were grouped into 18 categories based on the International Classification of Primary Care-3 (ICPC-3) of the World Health Organization (WHO). To assess the consistency and agreement among informants regarding the medicinal uses of plants, the Informant Consensus Factor (ICF) index was calculated (Heinrich et al., 1998; Albuquerque et al., 2014) according to the following formula:

$$ICF = (Nur-Nt) / (Nur-1)$$

where Nur refers to the number of reports for each symptom or disease category, and Nt is the total number of species used for each category. A value close to 1 indicates high consensus among informants, suggesting that few plant species are widely recognized and used for a specific purpose, whereas a value close to 0 indicates low consensus, suggesting that informants disagree on which species are useful for a given purpose or that many different species are used for the same condition.

To evaluate the importance of each species based on the diversity and number of uses attributed by informants, the Relative Importance (RI) index was calculated (Bennett and Prance, 2000; Albuquerque et al., 2014) using the following formula:

$$RI = NT + NUC$$

where NT represents the number of therapeutic uses reported for the species, divided by the number of therapeutic uses of the most versatile species (i.e., the one with the highest number of reported uses). NUC represents the number of symptom/disease categories reported for the species, divided by the number of categories of the most versatile species (i.e., the one with reports spanning the greatest number of categories). RI values range from 0 to 2, with values closer to 2 indicating greater versatility in the diversity of medicinal uses attributed to a species.

The Relative Importance index was originally proposed to measure the usefulness of medicinal plants based on the number of pharmacological indications and ailments treated by each species (Bennett and Prance, 2000). In this sense, higher RI values reflect a greater diversity of therapeutic applications and are interpreted as an indicator of the cultural prominence and versatility of species within the local pharmacopoeia. This index has been widely used in ethnobotanical studies to identify culturally important medicinal plants, compare their relevance across contexts, and explore patterns of knowledge and use of medicinal flora (Janni and Bastien, 2004) However, RI values should not be interpreted as indicators of ecological importance, abundance, or availability of the species in the environment.

Results

Diversity of medicinal plants

A total of 157 angiosperm taxa were recorded (Figs. 2, 3), distributed across 116 genera and 52 families, along with 2 pteridophyte species, represented by 2 families. Of these, 153 specimens were identified to the species level and six to the genus level. The best-represented family was Asteraceae with 32 species, followed by Lamiaceae (18 spp.), Rosaceae (9 spp.), Apiaceae (7 spp.), Myrtaceae (6 spp.), and Malvaceae, Polygonaceae and Solanaceae (5 spp. each). The most species-rich genera were *Rubus* L. (6 spp.), *Espeletia* Mutis ex Bonpl. (5 spp.), *Mentha* L., *Phytolacca* L., *Rumex* L. and *Senecio* L. (4 spp. each) (Appendix).

Regarding growth habit, herbaceous plants predominated (52.8%), followed by shrubs (21.4%), subshrubs (16.4%), trees (4.4%), caulescent rosettes (3.1%), and climbers (1.9%) (Appendix). With respect to biogeographic origin, 99 native and 60 introduced species were identified. Among the native species, 81 were wild and 18 cultivated, whereas among the introduced species, 53 were cultivated and 7 naturalized. The most representative families of native species were Asteraceae (26 spp.), Rosaceae (7 spp.), Lamiaceae, Myrtaceae y Solanaceae (5 spp. each), and Phytolaccaceae (4 spp.). The most diverse native genera were *Rubus* (6 spp.), *Espeletia* (5 spp.), *Phytolacca* and *Senecio* (4 spp. each), and *Myrcianthes* O.Berg and *Solanum* L. (3 spp. each). Among introduced species, the most representative families were Lamiaceae (13 spp.), Asteraceae (6 spp.), Apiaceae (4 spp.), and Amaryllidaceae, Malvaceae and Polygonaceae (3 spp. each). The most species-rich introduced genera were *Mentha* (4 spp.),

Figure 2: Some native medicinal plants reported in high mountain areas of the department Cundinamarca, Colombia. A. *Achyrocline bogotensis* DC. (viravira, Asteraceae); B. *Baccharis tricuneata* (L.f.) Pers. (sanalotodo, Asteraceae); C. *Clinopodium brownei* (Sw.) Kuntze (poleo, Lamiaceae); D. *Espeletia argentea* Humb. & Bonpl. (frailejón, Asteraceae); E. *Espeletia uribei* Cuatrec. (frailejón, Asteraceae); F. *Nertera granadensis* (Mutis ex L.f.) Druce (corales, Rubiaceae); G. *Peperomia subspathulata* Yunck. (canelón, Piperaceae); H. *Phytolacca icosandra* L. (guaba, Phytolaccaceae); I. *Phytolacca sanguinea* H.Walter (guaba, Phytolaccaceae); J. *Plantago australis* Lam. (llantén, Plantaginaceae); K. *Psidium pedicellatum* McVaugh (arrayán, Myrtaceae); L. *Rubus floribundus* Kunth (mora de monte, Rosaceae); M. *Senecio niveoaureus* Cuatrec. (árnica, Asteraceae); N. *Valeriana pilosa* Ruiz & Pav. (valeriana, Caprifoliaceae); O. *Vasconcellea pubescens* A.DC. (papayuela, Caricaceae); P. *Verbena litoralis* Kunth (verbena, Verbenaceae). Photographs: A.-P.=Erika Hernández-Aldana, except B.=Robinson Galindo, J.=Cristian Castro, M.=Julio Betancur.

Figure 3: Some introduced medicinal plants reported in high mountain areas of the department Cundinamarca, Colombia. A. *Calendula officinalis* L. (caléndula, Asteraceae); B. *Dysphania ambrosioides* (L.) Mosyakin & Clemants (paico, Amaranthaceae); C. *Mentha* × *piperita* L. (hierbabuena, Lamiaceae); D. *Ruta graveolens* L. (ruda, Rutaceae); E. *Tagetes zypaquirensis* Bonpl. (ruda jamaica, Asteraceae); F. *Tanacetum parthenium* (L.) Sch.Bip. (manzanilla amarga, Asteraceae). Photographs: Erika Hernández-Aldana.

Allium L. and *Rumex* (3 spp. each), and *Bougainvillea* Comm. ex Juss., *Malva* L., *Origanum* L. and *Pelargonium* L'Hér. (2 spp. each).

Plant parts used, preparation methods, and modes of administration

The plant part most frequently reported as used was the leaf (31.2%), followed by stems/branches (24.9%), flowers (11.2%), and fruits (9.3%) (Appendix). Notably, in 13.3% of reports, informants did not specify the plant part used for medicinal purposes. According to 96.6% of the reports, some form of prior preparation was required before use; in the remaining 3.4% of reports, informants stated they could not recall whether preparation was needed. Regarding preparation methods, the most frequently mentioned were infusion (34%), decoction (29.6%), and juices or extracts (11.8%) (Appendix). The primary route of administration was oral (45.5%), followed by topical application to skin (30.6%). In 16.7% of reports, no specific route of administration was indicated (Appendix).

Knowledge and use of species

A total of 2063 use reports were recorded, of which 832 corresponded to native species and 1231 to introduced ones. On average, the ten native species with the highest number of reports had 38.8 use reports each. These were: *Clinopodium brownei* (Sw.) Kuntze (92), *Niphogeton ternata* (Schult.) Mathias & Constance (77), *Rubus floribundus* Kunth (56), *Vasconcellea pubescens* A.DC. (30), *Equisetum bogotense* Kunth (28), *Peperomia subspathulata* Yunck. (26), *Plantago australis* Lam. (22), *Phytolacca icosandra* L. (21), *Senecio niveoaureus* Cuatrec. (19), and *Cinchona pubescens* Vahl (17). In contrast, the ten most frequently reported introduced species had an average of 76.2 use reports each. These were: *Calendula officinalis* L. (153), *Matricaria chamomilla* L. (103), *Melissa officinalis* L. (92), *Ruta graveolens* L. (92), *Sambucus nigra* L. (82), *Artemisia absinthium* L. (65), *Rosmarinus officinalis* L. (64), *Aloe vera* (L.) Burm.f. (55), *Tanacetum parthenium* (L.) Sch.Bip. (51), and *Aloysia citrodora* Paláu (49).

To assess differences in medicinal plant knowledge at the informant level, we compared the number of native and introduced species cited per informant. Results showed that informants cited significantly more introduced species (X=7.93±4.34 Ds) than native species (X=4.71±4.80 Ds) (V=947.5; $p<0.001$), supporting the hypothesis that introduced species are more frequently known and used. The Informant Consensus Factor (ICF), calculated for categories of symptoms and diseases, ranged between 0 and 0.89. A high degree of agreement among informants and a non-random selection of species was observed for the digestive system category, which showed the highest consensus (ICF=0.89), with 594 reports, covering 22 conditions and the use of 67 species. The second highest consensus was found for the respiratory system category (ICF=0.86), with 417 reports, 15 conditions and 61 species. The skin system category also showed a high consensus (ICF=0.86), with 367 reports, 24 conditions, and 54 species mentioned (Table 1).

Greater versatility was recorded in four species (Relative Importance Index, RI≥1.5), indicating that each of these is widely recognized for its ability to treat multiple symptoms and diseases (Table 2). The species with the highest level of versatility was *Matricaria chamomilla* (RI=2), reported for the treatment of 28 conditions across 14 categories. This was followed by *Ruta graveolens* (RI=1.96), associated with 27 conditions across 14 categories; and *Rosmarinus officinalis* (RI=1.57) and *Aloe vera* (RI=1.57), with 26 conditions in 9 categories. All these highly versatile species are introduced. Among the native species, the most versatile were *Niphogeton ternata* (RI=1.47), recorded for 19 conditions in 11 categories; *Clinopodium brownei* (RI=1.21), with 18 conditions in 8 categories; and *Baccharis tricuneata* (L.f.) Pers. (RI=1.03), with 13 conditions across 8 categories. On average, native species exhibited an RI of 0.31, whereas introduced species had an RI of 0.52.

Discussion

Diversity of medicinal plants

The rural communities inhabiting the high Andean zones of the department of Cundinamarca possess extensive knowledge of medicinal plant use. In this study, a total of 159 medicinal plant species were documented, including 99 native and 60 introduced species. The combined use of both native and exotic medicinal flora reflects the

Table 1: Informant Consensus Factor (ICF) for the 20 categories of symptoms and diseases reported in high mountain areas of the department Cundinamarca, Colombia. * ICF values for categories with fewer than five reports should be interpreted with caution due to limited sample size.

Category	Reports	Number of taxa	ICF
Digestive system	594	67	0.89
Respiratory system	417	61	0.85
Skin system	367	54	0.85
Pregnancy and maternity	15	4	0.79
Psychological, mental, and neurodevelopment	96	24	0.76
Visual system	16	5	0.73
Circulatory system	107	30	0.73
Genital system	56	18	0.69
Urinary system	66	28	0.58
Auditory system	5	3	0.50
Nervous system	24	15	0.39
Endocrine, metabolic, and nutritional system	20	13	0.37
Musculoskeletal system	54	37	0.31
Blood, hematopoietic organs, and immune system	6	5	0.20
General intoxications with unspecified cause	1	1	0
Family planning	1	1	0

Table 2: Most versatile medicinal plant species recorded in high mountain areas of the department Cundinamarca, Colombia. The species are ordered according to the Relative Importance Index=RI. Native species are indicated with an asterisk (*).

Species	Family	Local name	Ailment	Mode of preparation	RI
Matricaria chamomilla L.	Asteraceae	Manzanilla	Abdominal bloating, alopecia, anxiety, bronchitis, coronavirus disease 2019, cough, dyspepsia, flatulence, gastric and general pain, headache, hypertension, influenza, labor induction and pain, menstrual pain, ocular irritation, oral contraception, shortness of breath, skin infection, sleep disturbances, toothache, varicose veins	Infusion, decoction, poultice, plaster	2
Ruta graveolens L.	Rutaceae	Ruda	Abdominal bloating, bruise or contusion, ear pain, fever, gastric pain, gastritis, headache, hepatic symptoms, labor pain, loss of appetite, menstrual pain, muscle pain, nasal bleeding, nausea and vomiting during pregnancy, postpartum symptoms or complaints, ovarian cyst, toothache, weakened immune system	Infusion, decoction, poultice, plaster, juice	1.96

Table 2: Continuation.

Species	Family	Local name	Ailment	Mode of preparation	RI
Aloe vera (L.) Burm.f.	Xanthorrhoeaceae	Sábila	Arthritis, bronchitis, burns, cough, dry skin, general pain, fever, gastritis, hemorrhoids, hyperglycemia, irritable bowel syndrome, onychomycosis, skin swelling, sunburn, varicose veins, whooping cough	Infusion, decoction, soaking, poultice, syrup, juice	1.57
Rosmarinus officinalis L.	Lamiaceae	Romero	Allergies, alopecia, anxiety, back pain, bone pain, cough, circulatory disorders, gastric pain, gastritis, gastrointestinal infection, gum swelling, hypercholesterolemia, hypertension, joint pain, head lice, muscle tension and pain, nasal congestion, palpitations, rash, skin swelling, sleep disturbances, toothache, urinary retention	Infusion, decoction, soaking	1.57
Niphogeton ternata (Schult.) Mathias & Constance*	Apiaceae	Apio de páramo	Abdominal bloating, abdominal pain, diarrhea, dyspepsia, fever, gastric and general pain, headache, hepatic symptoms, influenza, intestinal helminths, irritable bowel syndrome, menstrual pain, nausea, renal symptoms, skin swelling	Infusion, decoction, juice	1.47
Calendula officinalis L.	Asteraceae	Caléndula	Abdominal bloating, bruise or contusion, diarrhea, gastric and general pain, gastritis, general infections, heartburn, joint pain, menstrual pain, mouth sores, palpitations, peptic ulcer, skin infections, swelling, and wounds, shortness of breath, sunburn, tonsillitis, vomiting	Infusion, decoction, soaking, poultice, compress, plaster, juice	1.39
Melissa officinalis L.	Lamiaceae	Toronjil	Abdominal bloating, anxiety, circulatory disorders, constipation, cough, fever, gastric and general pain, general weakness, headache, hypertension, palpitations, sleep disturbances, stress, rash, tendonitis, varicella	infusion, decoction, poultice, juice	1.28
Clinopodium brownei (Sw.) Kuntze*	Lamiaceae	Poleo	Abdominal bloating, bedwetting, cough, fever, flatulence, gastric and general pain, general weakness, headache, influenza, lactation issue, menstrual pain, nasal congestion, sleep disturbance	Infusion, decoction, poultice, plaster	1.21

Table 2: Continuation.

Species	Family	Local name	Ailment	Mode of preparation	RI
Foeniculum vulgare Mill.	Apiaceae	Hinojo	Cough, decreased visual acuity, eye irritation, general pain, headache, lactation issue, palpitations, renal symptoms, sleep disturbance	Infusion, decoction, soaking, compress, poultice	1.18
Ocimum basilicum L.	Lamiaceae	Albaca	Abdominal pain, dyspepsia, flatulence, gastric and general pain, general weakness, headache, hepatic symptoms, influenza, renal symptoms, stress, tendonitis	Infusion, decoction	1.14
Baccharis tricuneata (L.f.) Pers.*	Asteraceae	Sanalotodo	Anxiety, arthritis, skin wounds, oral candidiasis, gastric and general pain, gastritis, hepatic and renal symptoms, influenza, rhinitis	Ecoction, poultice, compress	1.03

historical and cultural processes that have shaped how these communities address their ailments and health conditions.

Although this study documents the diversity and patterns of medicinal plant use, it did not specifically examine how medicinal knowledge is transmitted within these communities (e.g., intergenerational, family-based, or through local specialists). Understanding the processes through which this knowledge is learned, maintained, and adapted would provide additional insight into the persistence and transformation of local pharmacopoeias and represent an important direction for future research.

A key finding of this study is the substantial proportion of introduced medicinal species in the region, which together account for nearly 12% of the foreign medicinal flora reported in Colombia (Bernal and Mesa, 2022). Most of these species are cultivated in home gardens, while some have become naturalized, and they are valued for their accessibility and therapeutic versatility. Indeed, 60% of all use reports corresponded to introduced plants. Species such as *Matricaria chamomilla* (RI=2), *Ruta graveolens* (RI=1.96), *Rosmarinus officinalis* (RI=1.57), and *Aloe vera* (RI=1.57) stand out for their frequent use and wide range of treated ailments (Bennett and Prance, 2000; Janni and Bastien, 2004; Hart et al., 2017; Yessoufou et al., 2021). The predominance of introduced medicinal flora is a phenomenon reported in various regions, as these plants are often integrated into local medical traditions due to the ease of accessing cultivated material and the availability of information about their properties and uses (Frei et al., 2000; Begossi et al., 2002; Medeiros, 2013; Medeiros et al., 2013; Hart et al., 2017).

In contrast, native species such as *Niphogeton ternata* (RI=1.47), *Clinopodium brownei* (RI=1.21) and *Baccharis tricuneata* (RI=1.03), although not as versatile as some introduced species, remain an important part of the medicinal practices of the communities in this region. The Andean native flora exhibits a wide functional diversity, is well adapted to local environmental conditions, and collectively represents a substantial but still underutilized reservoir of medicinal resources, largely due to its limited scientific study (Bernal et al., 2011). One potential factor influencing the use of the species may be the limited access of local inhabitants to plant material, since most of these species are wild and grow in natural paramo or high Andean forest ecosystems, generally far from residential areas and subject to accessibility restrictions. However, this study did not evaluate the ecological availability, abundance, or accessibility of these species in the landscape. Therefore, it is not possible to determine whether their relatively lower

use reflects ecological limitations, patterns of accessibility, or cultural preferences in medicinal plant selection.

A current conservation issue in these high Andean ecosystems is the increasing isolation of local communities, resulting from restrictive measures implemented by regional and local environmental authorities. This situation is recurrent along the Colombian high Andean belt, creating unresolved socio-environmental conflicts (Avellaneda-Torres et al., 2015; De Pourcq et al., 2017; Méndez Polo, 2019; Escalante Rubio, 2021).

Another important finding is that 23.6% of the species recorded in this study (8 native and 31 introduced) are included in the national list of medicinal plants approved for the development of phytotherapeutic products (INVIMA, 2021). The fact that only eight native species are listed underscores the need for phytochemical and pharmacological studies to demonstrate their efficacy and safety, thereby contributing to the incorporation of more native species into formal medicinal use. Such studies could also expand knowledge about the therapeutic properties and medicinal uses of native plants, promoting both their conservation and sustainable use. This trend is not unique to the high Andean medicinal flora but reflects a broader national situation (Bernal et al., 2011). Although Colombia harbors a remarkable diversity of native medicinal plants, there remains a significant gap in scientific evidence regarding their efficacy and safety.

Some species reported by informants, such as *Digitalis purpurea* L. or *Symphytum officinale* L. are known to contain potentially toxic compounds (Brown et al., 2016; Karakoti et al., 2025). Although their application is supported by the traditional knowledge regarding preparation and dosage, improper use may pose health risks. This highlights the importance of considering the pharmacological information provided by the national list of medicinal plants (INVIMA, 2021), as well as the need for further pharmacological and toxicological studies to evaluate their safety and guide their appropriate use.

Among the flora recorded here, the families Asteraceae and Lamiaceae emerged as the most relevant due to their high number of medicinal species, consistent with findings from other studies conducted in high mountain areas of the region (Ariza Cortés et al., 2004; Toscano González, 2006; Lagos-López, 2007; Cadena-González et al., 2013; Galvis Rueda and Torres Torres, 2017; Pérez and Matiz-Guerra, 2017; Alcántara Rodríguez et al., 2018). These two families also stand out nationally for their representation among medicinal plants (Bernal et al., 2011). Specifically, 32 species belonging to Asteraceae were recorded of which 81.3% are native. This highlights the high diversity of this family in paramo ecosystems and adjacent areas of Colombia (Rangel Churio, 2000). Moreover, several studies have demonstrated the chemical diversity of Asteraceae species, reinforcing their value as a rich medicinal resource (Michel et al., 2020; Trinh et al., 2020; Rolnik and Olas, 2021). In the case of Lamiaceae, 18 species were documented of which 72.2% are introduced. Their prominence likely reflects the presence of aromatic species originating from the Old World pharmacopoeia, widely cultivated in home gardens, and valued for their analgesic, antioxidant, antimicrobial, and anti-inflammatory properties, as reported in other studies (Carović-Stanko et al., 2016; Uritu et al., 2018).

Of the species recorded, the herbaceous growth form was predominant, accounting for 84 species in total, of which 57.1% were native and 42.9% were introduced. The predominance of this growth form has also been reported in other studies conducted in high Andean zones (Cadena-González et al., 2013; Alcántara Rodríguez et al., 2018) and in research from other regions of the world (de Albuquerque et al., 2007; Pathy et al., 2021; Tahir et al., 2021). The use of leaves as the most frequently utilized plant part (31.2%) is consistent with patterns observed in ethnobotanical studies, where leaves are often selected due to their high concentration of secondary metabolites, the minimal impact caused by their collection, and their ease of processing (Zambrano-Intriago et al., 2015; Tahir et al., 2021; Pathy et al., 2021). Leaves contain a wide spectrum of bioactive metabolites, including alkaloids, terpenoids, and phenolic compounds, which confer medicinal properties to plants (Michel et al., 2020).

Medicinal uses and species diversity

Local knowledge guiding the selection and use of medicinal plants is closely linked to ecological and social factors

(de Albuquerque, 2006; Gaoue et al., 2017). The most frequently used species tend to be those located near households, typically cultivated plants or naturalized species that grow among crops or within home gardens (Gazzaneo et al., 2005; Hart et al., 2017; Camacho-Hernández et al., 2022). However, preferences for particular medicinal plants are also influenced by the prevalence of specific health conditions and the level of knowledge about the therapeutic properties of these resources (Joshi and Joshi, 2000; de Almeida et al., 2010; da Costa Ferreira et al., 2021). The fact that introduced species exhibited a higher Relative Importance Index (RI) compared to native ones could be associated with their accessibility and their ability to treat a broader range of ailments (Hart et al., 2017). This pattern aligns with the versatility hypothesis, which suggests that cosmopolitan introduced species are more likely to be attributed additional medicinal uses due to greater opportunities for experimentation and knowledge exchange (Hart et al., 2017; Yessoufou et al., 2021, 2022).

The consensus regarding the use of plants to treat digestive and respiratory disorders reflected by Informant Consensus factor (ICF) values of 0.89 and 0.85, respectively, underscores the significance of these ailment categories in the daily lives of local communities. It also suggests that community members share a common understanding of the medicinal plants suitable for treating these symptoms and diseases. Ethnobotanical studies conducted in Andean mountain ecosystems within the region have reported that most use records are associated with these same categories of symptoms and health conditions (Lagos-López, 2007; Cadena-González et al., 2013; Galvis Rueda and Torres Torres, 2017). Across various regions of Colombia and Latin America, gastrointestinal and respiratory illnesses are prevalent, often linked to living conditions in rural areas and limited access to formal healthcare systems (Arrieta Flórez et al., 2021; Prieto-Ortiz, 2022; Farias Macias and San Lucas Quimis, 2023; Picay Suarez and Reyes Pilay, 2023; Guido et al., 2024). In this context, medicinal plants play a crucial role as primary resources for treating a wide range of ailments in rural communities.

The value of traditional knowledge in the current context

The knowledge held by high Andean communities regarding medicinal plants not only reflects cultural heritage and inherited practices but also responds to contemporary socioeconomic and environmental conditions. The greater versatility and frequency of use of introduced plants suggests that these communities are incorporating new knowledge and adapting to the changing plant environment, making use of easily accessible species that best meet their health needs. Within this context, a critical concern lies in the future of native species that inhabit areas with limited accessibility. Although these plants are less commonly used today, they represent a reservoir of medicinal plant diversity that remains largely unexplored. Promoting phytochemical and pharmacological studies of these native resources is therefore essential to uncover their therapeutic potential, an effort that has long been emphasized in Colombia (Bernal et al., 2011).

Similar patterns have been reported in other ethnobotanical studies conducted in the Andean region of Colombia. For example, research in rural areas of Bogotá has documented the coexistence of native and introduced species within local pharmacopoeias, with a strong presence of plants cultivated in home gardens, which facilitate access and continuous use (Pérez and Matiz-Guerra, 2017). In contrast, an ethnobotanical study in the Sierra Nevada del Cocuy-Güicán reported a predominance of native useful plants (68%) over introduced species (32%) (Alcántara Rodríguez et al., 2018), highlighting how the composition of medicinal floras can vary depending on ecological availability and cultural practices.

Author contributions

Conceptualization: NG, EHA; Formal analysis: NG, EHA; Methodoly: NG, EHA; Investigation: NG, EHA; Writing – original draft: NG, EHA; Writing – review and editing: NG.

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Data availability statement

The dataset supporting the findings of this study has been deposited in SciELO Data and can be accessed at https://doi.org/10.48331/SCIELODATA.JMWADW.

Declaration of Artificial Intelligence Use

Artificial intelligence (AI) tools were used to support text editing, including translation and improvement of the wording.

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Appendix: Medicinal plants recorded in high mountain areas of the department Cundinamarca, Colombia. Origin: Native=N, Introduced=I. Cultivation status: Wild=W, Cultivated=C, Naturalized=N. Growth habit: Herb=H, Subshrub=Ss, Shrub=S, Tree=T, Caulescent rosette=Cr, Climber=Cl. Mode of preparation: Infusion=In, Decoction=De, Boiling=Bo, Soaking=So, Poultice=Po, Compress=Co, Plaster=Pl, Juice=Ju, Powder=Pw, Syrup=Sy, None=No. Plant part used: Leaf=Le, Aerial parts=Ap, Root, bulb or tuber=Ro, Bark=Ba, Flower=Fl, Fruit=Fr, Seed=Se, Exudates=Ex, Whole plant=Wp, Not reported=Nr. Relative Importance Index=RI. Herbario Nacional Colombiano=COL, Herbario de la Pontificia Universidad Javeriana=HPUJ.

Family/Species	Origin	Cultivation status	Growth habit	Ailment	Mode of preparation	Plant part used	RI	Voucher	Local name
HELECHOS Y LICOFITAS									
Equisetaceae									
Equisetum bogotense Kunth	N	W	H	Back pain, cough, general infections, hyperglycemia, prostatic and renal symptoms, urinary retention	In, De	Ap	0.65	*Hernández-A, 1456* (COL, HPUJ)	Cola de caballo
Lycopodiaceae									
Lycopodium clavatum L.	N	W	H	Tendonitis	De, Po	Ap, Wp	0.21	*Hernández-A, 1349* (COL, HPUJ)	Caminadera
MAGNÓLIDAS									
Chloranthaceae									
Hedyosmum colombianum Cuatrec.	N	W	S	Cough, influenza	In, De	Le, Fr	0.14	*Hernández-A, 1301* (COL, HPUJ)	Granizo
Piperaceae									
Peperomia subspathulata Yunck.	N	W	H	Abdominal bloating, cardiac symptoms, diarrhea, dyspepsia, fever, flatulence, gastric pain, headache, influenza, nasal congestion, peptic ulcer	In, De	Le, Ap	0.82	*Hernández-A, 1371* (COL, HPUJ)	Canelón
Piper barbatum Kunth	N	W	S	Diarrhea, influenza, skin infection, skin wounds	De	Le	0.39	*Hernández-A, 1362A* (COL, HPUJ)	Cordoncillo
MONOCOTYLEDONEAE									
Amaryllidaceae									
Allium cepa L.	I	C	H	Bronchitis, cough	De	Ro	0.14		Cebolla roja
Allium fistulosum L.	I	C	H	Fever, gastric pain, intestinal helminths, menstrual pain, prostatic symptoms, skin infection	De, Ju	Ro, Le, Ap	0.5		Cebolla junca
Allium sativum L.	I	C	H	Amebiasis, arthritis, dyspepsia, gastric and general pain, intestinal helminths, hypercholesterolemia, hypertension, hypertriglyceridemia	So, Ju	Ro	0.72		Ajo

Appendix: Continuation.

Family/Species	Origin	Cultivation status	Growth habit	Ailment	Mode of preparation	Plant part used	RI	Voucher	Local name
Commelinaceae									
Tripogandra multiflora (Sw.) Raf.	N	W	H	Fractures, skin wounds, sprains	De, Po, Ju	Ap	0.39	*Hernández-A, 1366* (COL, HPUJ)	Suelda con suelda
Cyperaceae									
Rhynchospora nervosa (Vahl) Boeckeler	N	W	H	Cough, influenza	In, De	Fl	0.18		Totes
Eriocaulaceae									
Paepalanthus alpinus Körn.	N	W	H	Epilepsy, sunburn	So	Le	0.21	*Hernández-A, 1361* (COL, HPUJ)	Cardita
Orchidaceae									
Cyrtochilum revolutum (Lindl.) Dalström	N	W	H	Pulmonary and renal symptoms, ovarian cyst	Ju	Ap	0.32	*Hernández-A, 1362* (COL, HPUJ)	Guadija
Poaceae									
Cenchrus clandestinus (Hochst. ex Chiov.) Morrone	I	C	H	Hypertension	In, De	Ap, Wp	0.11		Kikuyo
Cymbopogon citratus (hort. ex DC.) Stapf	I	C	H	Anxiety, diarrhea, gastric pain, stress	In, De	Le, Ap	0.42		Limonaria
Sporobolus indicus (L.) R.Br.	N	W	H	Gum swelling	De	Ro	0.11		Llano
Xanthorrhoeaceae									
Aloe vera (L.) Burm.f.	I	C	H	Arthritis, bronchitis, burns, cough, dry skin, general pain, fever, gastritis, hemorrhoids, hyperglycemia, irritable bowel syndrome, onychomycosis, skin swelling, sunburn, varicose veins, whooping cough	In, De, So, Po, Sy, Ju	Le, Ap	1.57		Sábila
EUDICOTYLEDONEAE									
Adoxaceae									
Sambucus nigra L.	I	C	S	Cough, coronavirus disease 2019, diarrhea, fever, general infections, influenza, skin infections, swelling, and wounds, sore throat, toothache	In, De, Po, Sy	Ba, Le, Fl, Fr	0.86	*Parrado, 2* (HPUJ)	Sauco

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Appendix: Continuation.

Family/Species	Origin	Cultivation status	Growth habit	Ailment	Mode of preparation	Plant part used	RI	Voucher	Local name
Amaranthaceae									
Dysphania ambrosioides (L.) Mosyakin & Clemants	I	C	H	Gastric pain, general infections, hepatic symptoms, intestinal helminths, skin wounds, vaginitis	De, Ju	Ro, Le, Ap	0.54	*Hernández-A, 1376* (COL, HPUJ)	Paico
Apiaceae									
Apium graveolens L.	I	C	H	Abdominal bloating, dyspepsia, gastric pain, influenza	In, De	Le, Ap	0.61		Apio
Cyclospermum leptophyllum (Pers.) Sprague ex Britton & P.Wilson	N	W	H	Abdominal pain, menstrual pain	In	Ap	0.21		Jumaria
Foeniculum vulgare Mill.	I	C	H	Cough, decreased visual acuity, eye irritation, general pain, headache, lactation issue, palpitations, renal symptoms, sleep disturbance	In, De, So, Co, Po	Le, Ap, Fl	1.18	*Hernández-A, 1389* (COL, HPUJ)	Hinojo
Niphogeton glaucescens (Kunth) J.F.Macbr.	N	W	H	Abdominal pain, gastric pain, general pain, influenza, intestinal helminths	In, De	Ap, Wp	0.39	*Hernández-A, 1307* (COL, HPUJ)	Apio
Niphogeton ternata (Schult.) Mathias & Constance	N	W	H	Abdominal bloating, abdominal pain, diarrhea, dyspepsia, fever, gastric and general pain, headache, hepatic symptoms, influenza, intestinal helminths, irritable bowel syndrome, menstrual pain, nausea, renal symptoms, skin swelling	In, De, Ju	Le, Ap, Fr, Wp	1.47	*Hernández-A, 1305* (COL, HPUJ)	Apio de páramo
Petroselinum crispum (Mill.) Fuss	I	C	H	Anxiety, back pain, cardiac symptoms, circulatory disorders, gastric pain, overweight, renal infection and pain	In, De, Ju	Le, Ap	0.72		Perejil
Pimpinella anisum L.	I	C	H	Abdominal bloating, influenza	In, De	Le, Ap	0.21		Anís
Asteraceae									
Achyrocline bogotensis DC.	N	W	H	Cough, gastritis, menorrhagia, urinary retention, prostatic and renal symptoms	In, De, Ju	Le, Ap	0.5	*Hernández-A, 1279* (COL, HPUJ)	Viravira
Ageratina ampla (Benth.) R.M.King & H.Rob.	N	W	S	Arthritis, varicose veins	De, Po, Ju	Le, Ap	0.32	*Hernández-A, 1327* (COL, HPUJ)	Jarilla

Appendix: Continuation.

Family/Species	Origin	Cultivation status	Growth habit	Ailment	Mode of preparation	Plant part used	RI	Voucher	Local name
Ageratina gracilis (Kunth) R.M.King & H.Rob.	N	W	H	Bruise or contusion, skin wounds, skin swelling	In, De	Ap	0.21	*Parrado, 22* (HPUJ)	Sanativa
Ambrosia cumanensis Kunth	N	C	Ss	Arthritis, bruise or contusion, fever, flatulence, gastric pain, skin swelling	In, De, Po	Le, Ap, Fr	0.68	*Hernández-A, 1395* (COL, HPUJ)	Altamisa
Artemisia absinthium L.	I	C	Ss	Diarrhea, ear pain, fever, flatulence, gastric and general pain, gastritis, heartburn, hepatic symptoms, intestinal helminths, menstrual pain, peptic ulcer, vomiting	In, De	Ro, Le, Ap, Fl	0.9	*Hernández-A, 1402* (COL, HPUJ)	Ajenjo
Baccharis tricuneata (L.f.) Pers.	N	W	S	Anxiety, arthritis, skin wounds, oral candidiasis, gastric and general pain, gastritis, hepatic and renal symptoms, influenza, rhinitis	De, Po, Co	Le, Ap	1.03	*Hernández-A, 1355* (COL, HPUJ)	Sanalotodo
Calendula officinalis L.	I	C	Ss	Abdominal bloating, bruise or contusion, diarrhea, gastric and general pain, gastritis, general infections, heartburn, joint pain, menstrual pain, mouth sores, palpitations, peptic ulcer, skin infections, swelling, and wounds, shortness of breath, sunburn, tonsillitis, vomiting	In, De, So, Po, Co, Pl, Ju	Le, Ap, Fl, Fr	1.39	*Hernández-A, 1415* (COL, HPUJ)	Caléndula
Espeletia argentea Humb. & Bonpl.	N	W	Cr	Abdominal bloating, arthritis, asthma, hyperglycemia, influenza, renal symptoms, shortness of breath, skin swelling, urinary retention	In, De, Po	Le	0.86	*Hernández-A, 1306* (COL, HPUJ)	Frailejón
Espeletia grandiflora Humb. & Bonpl.	N	W	Cr	Arthritis	No	Nr	0.11	*Giraldo, 687* (COL)	Frailejón
Espeletia killipii Cuatrec.	N	W	Cr	Arthritis	No	Nr	0.11		Frailejón

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Appendix: Continuation.

Family/Species	Origin	Cultivation status	Growth habit	Ailment	Mode of preparation	Plant part used	RI	Voucher	Local name
Espeletia uribei Cuatrec.	N	W	Cr	Abdominal bloating, arthritis, asthma, bleeding, influenza, renal symptoms, shortness of breath, skin swelling, urinary retention	In, De, Po	Le, Ex	0.86		Frailejón
Espeletia sp.	N	W	Cr	Arthritis, asthma, ear pain, hypertriglyceridemia	In	Le	0.47	*Hernández-A, 1366* (COL, HPUJ)	Frailejón botón dorado
Fleischmannia granatensis R.M.King & H.Rob.	N	W	H	Skin swelling	De, Ju	Le, Ap	0.11	*Hernández-A, 1443* (COL, HPUJ)	Almoraduz
Gamochaeta americana (Mill.) Wedd.	N	W	H	Renal symptoms, skin infection	In	Le, Ap	0.21	*Hernández-A, 1374* (COL, HPUJ)	Tusilla
Heliopsis buphthalmoides (Jacq.) Dunal	N	W	H	Gastric pain	Ju	Le	0.11	*Hernández-A, 1453* (COL, HPUJ)	Guaca
Hypochaeris sessiliflora Kunth	N	W	H	Renal symptoms, varicose veins	No	Ex	0.21	*Hernández-A, 1358* (COL, HPUJ)	Chicoria blanca
Jungia paniculata (DC.) A.Gray	N	W	Ss	Diarrhea, dyspepsia, gastric pain, sleep disturbance	In, De	Le, Fl	0.39	*Hernández-A, 1424* (COL, HPUJ)	Manolión
Lactuca sativa L.	I	C	H	Sleep disturbance	De	Le	0.11		Lechuga
Linochilus rosmarinifolius Benth.	N	C	S	Skin swelling	De	Le	0.11	*Hernández-A, 1459* (COL, HPUJ)	Romero
Matricaria chamomilla L.	I	C	H	Abdominal bloating, alopecia, anxiety, bronchitis, coronavirus disease 2019, cough, dyspepsia, flatulence, gastric and general pain, headache, hypertension, influenza, labor induction and pain, menstrual pain, ocular irritation, oral contraception, shortness of breath, skin infection, sleep disturbances, toothache, varicose veins	In, De, Po, Pl	Le, Ap, Fl	2		Manzanilla dulce
Pentacalia sp.	N	W	S	Sore throat	De	Le	0.11		Guasguin
Pseudognaphalium cheiranthifolium (Lam.) Hilliard & B.L.Burtt	N	W	H	Back pain	De	Ap	0.11	*Parrado, 27* (HPUJ)	

Appendix: Continuation.

Family/Species	Origin	Cultivation status	Growth habit	Ailment	Mode of preparation	Plant part used	RI	Voucher	Local name
Pseudognaphalium lanuginosum (Kunth) Anderb.	N	W	Ss	Prostate and renal symptoms	In, De	Le, Ap	0.21	*Hernández-A, 1246* (COL, HPUJ)	Viravira
Senecio formosoides Cuatrec.	N	W	H	Bruise or contusion, skin swelling and wounds	In, De	Le, Fl	0.21	*Hernández-A, 1251* (COL, HPUJ)	Árnica
Senecio formosus Kunth	N	W	Ss	Bruise or contusion, gangrene, penal symptoms, sciatica, skin infections, swelling, and wounds	In, De, Co	Le, Fl	0.61	*Hernández-A, 1343* (COL, HPUJ)	Árnica
Senecio garcibarrigae Cuatrec.	N	W	H	Blood clots, bruise or contusion, renal symptoms, skin wounds	In, De	Le, Ap, Fl	0.39	*Parrado, 25* (HPUJ)	Árnica
Senecio niveoaureus Cuatrec.	N	W	H	Arthritis, bruise or contusion, skin infections, swelling, and wounds, toothache	De, Co, Po	Le, Ap, Fl, Wp	0.58		Árnica
Smallanthus pyramidalis (Triana) H.Rob.	N	C	S	Arthritis, joint pain	Po	Le, Ap	0.25	*Hernández-A, 1439* (COL, HPUJ)	Arboloco
Smallanthus sonchifolius (Poepp.) H.Rob.	N	C	Ss	Hypercholesterolemia, hyperglycemia	No	Ro	0.21		Yacón
Tagetes zypaquirensis Bonpl.	N	W	H	Joint pain, muscle pain	Po	Ap	0.25	*Hernández-A, 1396* (COL, HPUJ)	Ruda jamaica
Tanacetum parthenium (L.) Sch.Bip.	I	C	H	Abdominal pain, cough, diarrhea, dyspepsia, gastric and general pain, heartburn, intestinal helminths, hepatic symptoms, menstrual pain, vomiting	In, De	Le, Ap, Fl	0.82	*Hernández-A, 1384* (COL, HPUJ)	Manzanilla amarga
Taraxacum officinale F.H.Wigg.	I	N	H	Diarrhea, fever, gastric pain, gastritis, hepatic symptoms, hypercholesterolemia, menstrual pain, peptic ulcer, prostate symptoms, renal pain, toothache, uric acid buildup, urinary retention	In, De, Ju	Ro, Le, Ap, Fl, Wp	0.93	*Hernández-A, 1287* (COL, HPUJ)	Diente de león
Basellaceae									
Anredera sp.	N	W	H	Skin swelling	Ju	Ap	0.11	*Hernández-A, 1422* (COL, HPUJ)	Rubaca
Ullucus tuberosus Caldas	N	C	H	Renal symptoms	Bo	Ro	0.11		Chugua

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Appendix: Continuation.

Family/Species	Origin	Cultivation status	Growth habit	Ailment	Mode of preparation	Plant part used	RI	Voucher	Local name
Boraginaceae									
Borago officinalis L.	I	C	Ss	Cough, fever, influenza, menorrhagia	In, De, Ju	Le, Ap, Fl	0.35	*Hernández-A, 1407* (COL, HPUJ)	Borraja
Symphytum officinale L.	I	C	Ss	Arthritis	In	Le	0.11		Cofrey
Brassicaceae									
Brassica oleracea L.	I	C	H	Abdominal bloating	De	Le	0.11		Kele
Cactaceae									
Epiphyllum phyllanthus (L.) Haw.	N	C	H	Cough	In, De	Le, Fl	0.11		Cactu
Caprifoliaceae									
Valeriana pilosa Ruiz & Pav.	N	W	H	Sleep disturbances, stress	In	Nr	0.14	*Hernández-A, 1344* (COL, HPUJ)	Valeriana
Caricaceae									
Vasconcellea pubescens A.DC.	N	C	S	Cough, influenza	In, De	Fr	0.25		Papayuela
Caryophyllaceae									
Stellaria media (L.) Vill.	I	N	H	Cough	In	Ap	0.11	*Hernández-A, 1368* (COL, HPUJ)	Veronica
Clusiaceae									
Clusia sp.	N	W	S	Warts	No	Ex	0.11	*Hernández-A, 1364* (COL, HPUJ)	Gaque
Cucurbitaceae									
Cucurbita ficifolia Bouché	I	C	Cl	Hyperglycemia, renal symptoms	In, Ju	Le, Fr	0.21		Calabaza
Sechium edule (Jacq.) Sw.	I	C	Cl	Hypercholesterolemia, hypertension	Ju	Fr	0.21		Guatila
Cunoniaceae									
Weinmannia sp.	N	W	T	Diarrhea, toothache	De, So	Ba	0.14		Encenillo
Ericaceae									
Bejaria resinosa L.f.	N	W	S	Influenza	De	Fl	0.11	*Moreno, 48* (HPUJ)	Pegamosco
Vaccinium meridionale Sw.	N	W	S	Weakened immune system	Ju	Fr	0.21		Agraz
Fabaceae									
Desmodium molliculum (Kunth) DC.	N	W	H	Skin swelling and wounds	De	Le	0.18	*Hernández-A, 1460* (COL, HPUJ)	Petaco

Appendix: Continuation.

Family/Species	Origin	Cultivation status	Growth habit	Ailment	Mode of preparation	Plant part used	RI	Voucher	Local name
Senna viarum (Little) H.S.Irwin & Barneby	N	C	S	Gastric pain	De	Le	0.11	*Parrado, 16* (HPUJ)	Caparro
Geraniaceae									
Geranium holosericeum Spreng.	N	W	H	Skin swelling and wounds	De, Po	Le	0.14		Yerba del dedo
Pelargonium cucullatum (L.) L'Hér.	I	C	Ss	Menorrhagia	In	Fl	0.11		Geranio blanco
Pelargonium odoratissimum (L.) L'Hér.	I	C	Ss	Gastric pain	In	Le	0.11		Aroma
Gunneraceae									
Gunnera bogotana L.E.Mora	N	W	H	Alopecia, cough, gastric pain, hyperglycemia, renal symptoms, skin swelling, urolithiasis	In, De, Ju	Fl, Fr	0.61	*Hernández-A, 1282* (COL, HPUJ)	Mazorca de agua
Gunnera saint-johnii (L.E.Mora) L.E.Mora	N	W	H	Cough, influenza, sore throat	De	Fl, Fr	0.18	*Robles, s.n.* (HPUJ)	Parra
Hypericaceae									
Hypericum mexicanum L.	N	W	Ss	Back pain, bruise or contusion	Po	Ap	0.25	*Hernández-A, 1345* (COL, HPUJ)	Lunaria
Juglandaceae									
Juglans neotropica Diels	N	C	T	Memory loss	De	Le	0.11		Nogal
Lamiaceae									
Clinopodium brownei (Sw.) Kuntze	N	W	H	Abdominal bloating, bedwetting, cough, fever, flatulence, gastric and general pain, general weakness, headache, influenza, lactation issue, menstrual pain, nasal congestion, sleep disturbance	In, De, Po, Pl	Le, Ap, Fr	1.21	*Hernández-A, 1364A* (COL, HPUJ)	Poleo
Lepechinia salviifolia (Kunth) Epling	N	W	S	Allergies, anxiety, circulatory disorders, cough, hypertension, sore throat and inflammation	In, De	Le, Fl	0.54	*Hernández-A, 1328* (COL, HPUJ)	Salvia
Lepechinia schiedeana (Schltdl.) Vatke	N	W	H	Abdominal bloating, gastric pain, headache, joint pain, tingling in fingers	In, De, So, Po	Le, Ap	0.54	*Hernández-A, 1408* (COL, HPUJ)	Salvia de páramo

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Appendix: Continuation.

Family/Species	Origin	Cultivation status	Growth habit	Ailment	Mode of preparation	Plant part used	RI	Voucher	Local name
Marrubium vulgare L.	I	C	Ss	Gastric pain, hepatic symptoms	In, De	Le	0.14		Manrubio
Melissa officinalis L.	I	C	H	Abdominal bloating, anxiety, circulatory disorders, constipation, cough, fever, gastric and general pain, general weakness, headache, hypertension, palpitations, sleep disturbances, stress, rash, tendonitis, varicella	In, De, Po, Ju	Le, Ap, Fl	1.28	*Hernández-A, 1370* (COL, HPUJ)	Toronjil
Mentha × *piperita* L.	I	C	H	Bruise or contusion, cough, diarrhea, fever, gastric pain, influenza, intestinal helminths, skin swelling, vomiting	In, De	Le, Ap	0.79	*Hernández-A, 1393* (COL, HPUJ)	Hierbabuena
Mentha pulegium L.	I	C	H	Anxiety, cough, gastric pain, general weakness, halitosis, influenza	In, De	Le, Ap	0.61	*Parrado, 9* (HPUJ)	Menta
Mentha spicata L.	I	C	H	Abdominal bloating, dermatitis, diarrhea, dyspepsia, gastric pain, hepatic symptoms, hypertriglyceridemia, influenza, intestinal helminths, muscle strain	In, De	Le, Ap	0.82	*Hernández-A, 1372* (COL, HPUJ)	Hierbabuena
Mentha suaveolens Ehrh.	I	C	H	Abdominal bloating, anxiety, dermatitis, diarrhea, depressive disorder, dyspepsia, fever, gastric pain, influenza, intestinal helminths, sleep disturbances	In, De, Po	Le, Ap	0.75	*Hernández-A, 1401* (COL, HPUJ)	Hierbabuena
Ocimum basilicum L.	I	C	H	Abdominal pain, dyspepsia, flatulence, gastric and general pain, general weakness, headache, hepatic symptoms, influenza, renal symptoms, stress, tendonitis	In, De	Le, Ap	1.14		Albaca
Origanum majorana L.	I	C	H	Anxiety, cough, gastric pain, headache	In, De, Po	Le, Ap	0.54	*Robles, 10* (HPUJ)	Mejorana
Origanum vulgare L.	I	C	H	Gastric pain	De	Le	0.11		Orégano
Plectranthus ornatus Codd	I	C	H	General pain	In	Le	0.11		Acetaminofén

Appendix: Continuation.

Family/Species	Origin	Cultivation status	Growth habit	Ailment	Mode of preparation	Plant part used	RI	Voucher	Local name
Rosmarinus officinalis L.	I	C	S	Allergies, alopecia, anxiety, back pain, bone pain, cough, circulatory disorders, gastric pain, gastritis, gastrointestinal infection, gum swelling, hypercholesterolemia, hypertension, joint pain, head lice, muscle tension and pain, nasal congestion, palpitations, rash, skin swelling, sleep disturbances, toothache, urinary retention	In, De, So	Le, Ap, Fl	1.57	*Hernández-A, 1413* (COL, HPUJ)	Romero
Salvia leucantha Cav.	I	C	S	Anxiety	In, De	Le	0.11	*Parrado, 12* (HPUJ)	Salvia amarga
Salvia palifolia Kunth	N	W	H	Bruise or contusion, circulatory disorders, rash, skin wounds, spasms, throat swelling	De	Le, Fl	0.5	*Parrado, 13* (HPHU)	Mastranto
Salvia scutellarioides Kunth	N	W	H	Gastric pain, gum swelling, hypertension, insect bites, skin swelling and wounds, toothache	In, De	Le, Ap	0.46	*Hernández-A, 1333* (COL, HPUJ)	Mastranto
Thymus vulgaris L.	I	C	Ss	Cough, diarrhea, gastric pain, headache, hypertension, menstrual pain	In, De, Ju	Le, Ap	0.61		Tomillo
Lauraceae									
Laurus nobilis L.	I	C	T	Varicose veins	Po	Le	0.11		Laurel
Loasaceae									
Nasa campaniflora (Urb. & Gilg) Weigend	N	W	S	Arthritis	Po	Le	0.11		Ortiga amarilla
Malvaceae									
Malva arborea (L.) Webb & Berthel.	I	C	Ss	Tendonitis	De	Le	0.11	*Hernández-A, 1419* (COL, HPUJ)	Malva
Malva parviflora L.	I	C	H	Abdominal pain, feet and skin swelling	In, De, Ju	Le, Ap, Fl,	0.32	*Hernández-A, 1441* (COL, HPUJ)	Malva
Melochia mollis (Kunth) Triana & Planch.	N	W	Ss	Skin swelling	De	Ap	0.11		Escobillo
Modiola caroliniana (L.) G.Don	N	W	H	Skin swelling	De, Ju	Ap	0.14	*Hernández-A, 1435* (COL, HPUJ)	Paté chulo

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Sparrmannia africana L.f.	I	C	S	Cough	In, De	Le, Fl	0.11	*Hernández-A, 1405* (COL, HPUJ)	Tilo
Melastomataceae									
Monochaetum bonplandii (Humb. & Bonpl.) Naudin	N	W	S	Acne, general infections, skin infections, swelling, and wounds	De	Le, Ap	0.35	*Hernández-A, 1387* (COL, HPUJ)	Terciopelo
Moraceae									
Ficus carica L.	I	C	S	Hypertension, muscular tension	De	Le	0.21		Brevo
Myricaceae									
Morella pubescens (Willd.) Wilbur	N	W	S	Anxiety	In	Ap	0.11	*Hernández-A, 1360* (COL, HPUJ)	Laurel de páramo
Myrtaceae									
Eucalyptus globulus Labill.	I	C	T	Bronchitis, bruise or contusion, coronavirus disease 2019, cough, fever, influenza, lung and nasal congestion, sore throat	In, De, Co	Ba, Le, Ap	0.57	*Hernández-A, 1440* (COL, HPUJ)	Eucalipto
Myrcia popayanensis Hieron.	N	W	S	Dental caries	No	Le	0.11		Arrayán colorado
Myrcianthes leucoxyla (Ortega) McVaugh	N	W	S	Abdominal bloating, anxiety, diarrhea, gastric pain, hyperglycemia, toothache	In, De, So	Ba, Le	0.54	*Hernández-A, 1353* (COL, HPUJ)	Arrayán
Myrcianthes orthostemon (O.Berg) Grifo	N	W	S	Diarrhea	De	Ba, Le, Ap	0.11	*Hernández-A, 1338* (COL, HPUJ)	Arrayán
Myrcianthes rhopaloides (Kunth) McVaugh	N	W	S	Diarrhea, influenza	De	Le, Fr	0.21	*Hernández-A, 1399* (COL, HPUJ)	Arrayán guayabo
Psidium pedicellatum McVaugh	N	C	S	Diarrhea, hyperglycemia, fever	De	Le, Fr	0.25	*Hernández-A, 1390* (COL, HPUJ)	Arrayán
Nyctaginaceae									
Bougainvillea glabra Choisy	I	C	S	Cough	In	Fl	0.11		Buganvilia
Bougainvillea spectabilis Willd.	I	C	S	Cough, pneumonia	In	Fl	0.14		Boganvil
Oxalidaceae									
Oxalis filiformis Kunth	N	W	H	Bronchitis, cough, influenza, sore throat	De	Le, Ap, Fr, Wp	0.25	*Hernández-A, 1377* (COL, HPUJ)	Cedera

Appendix: Continuation.

Family/Species	Origin	Cultivation status	Growth habit	Ailment	Mode of preparation	Plant part used	RI	Voucher	Local name
Phytolaccaceae									
Phytolacca bogotensis Kunth	N	W	H	Bruise or contusion, skin swelling and wounds, varicose veins	Ju	Ap	0.25	Hernández-A, 1365 (COL, HPUJ)	Guaba
Phytolacca icosandra L.	N	W	H	Bruise or contusion, skin infections, swelling, and wounds, rash, renal symptoms, varicose veins	In, De, Ju	Le, Ap, Fl, Fr	0.5	Hernández-A, 1444 (COL, HPUJ)	Guaba
Phytolacca rugosa A.Braun & C.D.Bouché	N	W	H	Acne, chilblains, rash, skin infections, swelling, and wounds, warts	De, Ju	Le, Ap, Fr	0.43	Hernández-A, 1325 (COL, HPUJ)	Guaba
Phytolacca sanguinea H.Walter	N	W	H	Skin infections, swelling, and wounds	De	Le, Ap, Fl, Fr	0.21	Hernández-A, 1286 (COL, HPUJ)	Guaba
Plantaginaceae									
Digitalis purpurea L.	I	N	H	Palpitations	In	Ap	0.14	Giraldo, 763 (COL)	Guargerón
Plantago australis Lam.	N	W	H	Bruise or contusion, constipation, general weakness, hepatic symptoms, heartburn, irritable bowel syndrome, skin swelling and wounds, renal symptoms	In, De, Ju	Le, Wp	0.72	Hernández-A, 1261 (COL, HPUJ)	Llantén
Plantago major L.	I	N	H	Decreased visual acuity, gastric pain, hepatic symptoms, peptic ulcer	In, De, So, Ju	Le, Ap	0.28	Hernández-A, 1458 (COL, HPUJ)	Llantén mayor
Polygonaceae									
Muehlenbeckia cf. *tamnifolia* (Kunth) Meisn.	N	W	Cl	Skin swelling and wounds	De	Le	0.18	Hernández-A, 1442 (COL, HPUJ)	Bejuco colorado
Rumex acetosella L.	I	N	H	Sore throat	Ju	Le, Ap	0.11	Parrado, 23 (HPUJ)	Cedera
Rumex conglomeratus Murray	I	N	H	Skin infections, swelling, and wounds	Ju	Le, Ap, Ex	0.21	Hernández-A, 1450 (COL, HPUJ)	Romaza
Rumex crispus L.	I	N	H	Alopecia, bleeding	So	Le	0.21	Hernández-A, 1339 (COL, HPUJ)	Romaza
Rumex tolimensis Wedd.	N	W	H	Pulmonary symptoms	No	Ex	0.25	García, 476 (COL)	Bijuaca
Ranunculaceae									
Ranunculus flagelliformis Sm.	N	W	H	Dyspepsia, gastric pain, hepatic symptoms, renal symptoms	So	Ap	0.28	Hernández-A, 1308 (COL, HPUJ)	Berros

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Rosaceae									
Hesperomeles obtusifolia (Pers.) Lindl.	N	W	S	Gouty arthritis	Ju	Ap, Fr	0.11	*Hernández-A, 1347* (COL, HPUJ)	Mortiño
Prunus persica (L.) Batsch	I	C	S	Gastric pain	In, De	Le	0.11		Durazno
Rubus acanthophyllos Focke	N	W	Ss	Cough, influenza, skin wounds	In, De, Po	Le, Ap, Fl, Fr	0.39	*Hernández-A, 1352* (COL, HPUJ)	Zarzaparrilla
Rubus bogotensis Kunth	N	W	Ss	Cough	De	Fr	0.11	*Giraldo, 771* (COL)	Mora de monte
Rubus floribundus Kunth	N	W	Ss	Anemia, arthritis, cough, lung congestion, influenza, sore throat	In, De, Sy, Ju	Le, Fl, Fr	0.46	*Hernández-A, 1296* (COL, HPUJ)	Mora de monte
Rubus glaucus Benth.	N	C	Ss	Cough	De	Fr	0.11	*Parrado, 1* (HPUJ)	Zarzamora
Rubus nubigenus Kunth	N	W	Ss	Cough, lung congestion	De	Fr	0.14	*Hernández-A, 1311* (COL, HPUJ)	Mora de oso
Rubus peruvianus Fritsch	N	W	Ss	Anemia, cough, hyperglycemia, skin wounds	In, De, Po	Le, Fl, Fr	0.47	*Hernández-A, 1341* (COL, HPUJ)	Mora de monte
Sanguisorba minor Scop.	I	C	H	Anxiety, cardiac symptoms, gastric pain	In, De, So	Le, Ap	0.35		Pempinela
Rubiaceae									
Cinchona lancifolia Mutis	N	W	T	Diarrhea, fever	De	Ba	0.21	*Hernández-A, 1383* (COL, HPUJ)	Quina
Cinchona pubescens Vahl	N	W	T	Coronavirus disease 2019, cough, diarrhea, fever, general infections	De	Ba, Le, Ap	0.39	*Hernández-A, 1381* (COL, HPUJ)	Quina
Nertera granadensis (Mutis ex L. f.) Druce	N	W	H	Cardiac arrhythmia, epilepsy	In, So	Fr	0.25	*Hernández-A, 1299* (COL, HPUJ)	Corales
Rutaceae									
Citrus × *aurantium* L.	I	C	S	Anxiety	In	Le	0.11		Naranjo

Appendix: Continuation.

Family/Species	Origin	Cultivation status	Growth habit	Ailment	Mode of preparation	Plant part used	RI	Voucher	Local name
Ruta graveolens L.	I	C	Ss	Abdominal bloating, bruise or contusion, ear pain, fever, gastric pain, gastritis, headache, hepatic symptoms, labor pain, loss of appetite, menstrual pain, muscle pain, nasal bleeding, nausea and vomiting during pregnancy, postpartum symptoms or complaints, ovarian cyst, toothache, weakened immune system	In, De, Po, Pl, Ju	Le, Ap, Fl, Fr	1.96	*Hernández-A, 1375* (COL)	Ruda
Salicaceae									
Salix humboldtiana Willd.	N	C	T	Abdominal bloating, fever, gastric pain, knee pain	De, Po	Le, Ap	0.35		Sauce
Solanaceae									
Capsicum cf. *annuum* L.	N	C	Ss	Toothache	So	Ba	0.11		Ají
Physalis peruviana L.	N	C	Ss	Cataract, hyperglycemia	Ju	Fr	0.21	*Hernández-A, 1369* (COL)	Uchuva
Solanum betaceum Cav.	N	C	S	General body improvement	De, Ju	Fr	0.07		Tomate de árbol
Solanum nigrescens M.Martens & Galeotti	N	W	H	Skin infections, swelling, and wounds, toothache	De, Ju	Le, Ap, Fr	0.32	*Hernández-A, 1447* (COL)	Yerbamora
Solanum tuberosum L.	N	C	H	Peptic ulcer	Ju	Ro	0.11		Papa
Tropaeolaceae									
Tropaeolum tuberosum Ruiz & Pav.	N	C	H	Renal symptoms	Bo	Ro	0.11		Cubios
Urticaceae									
Parietaria sp.	I	C	H	Fever, pulmonary and renal symptoms, skin infections	In, De, Ju	Le, Ap	0.35		Palietaria
Pilea alsinifolia Wedd.	N	W	H	Renal symptoms	De, Ju	Le, Ap	0.11	*Hernández-A, 1335* (COL)	Palitaria

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Urtica dioica L.	I	C	H	Allergies, alopecia, circulatory disorders, Herpes labialis, Herpes zoster (shingles), rash, rheumatic pain, skin wounds, spasms or cramps	In, De, Po	Le, Ap	0.96	*Hernández-A, 1403* (COL)	Ortiga
Verbenaceae									
Aloysia citrodora Paláu	I	C	S	Anxiety, cough, dyspepsia, fever, flatulence, gastric and general pain, general infections, influenza, sleep disturbance, stress	In, De, Ju	Le, Ap, Fl	0.93	*Hernández-A, 1380* (COL)	Cidrón
Lantana camara L.	N	C	S	Gastric pain	De	Fl	0.11		Yerba de tres flores
Verbena litoralis Kunth	N	W	Ss	Fever, hepatic symptoms, hypercholesterolemia, intestinal helminths	In, De, Ju	Ro, Le, Ap	0.35	*Hernández-A, 1297* (COL)	Verbena
Violaceae									
Viola odorata L.	I	C	H	Cough	In	Fl	0.11	*Parrado, 8* (HPUJ)	Violeta