Ethnobotany resources from Metropolitan Parks of Quito city

Paco Noriega, Lissette Calderón, Alberto Taxo Taco, María Belén Montaluisa, Kimberly Jaramillo and Patricia Noriega

Correspondence

Paco Noriega[1*], Lissette Calderón[1], Alberto Taxo Taco[1†], María Belén Montaluisa[1], Kimberly Jaramillo[1] and Patricia Noriega[2]

[1]Group of Research and Development in Sciences Applied to Biological Resources, Polytechnic Salesian University, Avenida 12 de Octubre N 2422 y Wilson, Quito 170109, Ecuador.
[2]Faculty of Social Communication, Central University of Ecuador, Bolivia Oe7-132 y Eustorgio Salgado, Quito 170507, Ecuador.

*Corresponding Author: pnoriega@ups.edu.ec

Ethnobotany Research and Applications 28:23 (2024) - http://dx.doi.org/10.32859/era.28.23.1-20
Manuscript received: 29/09/2023 – Revised manuscript received: 20/02/2024 - Published: 25/x02/2024

Research

Abstract

Background: Quito, the largest city in Ecuador, has a population of over two million. Despite significant growth in the last 50 years, remnants of native flora can still be found within the city's metropolitan park system. These parks contain large areas of both native and introduced ethnobotanical resources. This study aimed to collect and catalog species based on their medicinal, nutritional, ritual, and cosmetic properties. The opinions of informants with extensive knowledge of traditional medicine were considered, and many scientific documents were analyzed to obtain more information on each identified species.

Methods: Under the guidance of Andean sage Tayta Alberto Taxo Taco Chicaiza and accompanied by six informants, we visited five metropolitan parks in Quito known for their significant biodiversity. Between March and July 2017, we collected and identified medicinal species over several working days. To confirm the traditional knowledge, we then complemented our findings by evaluating approximately one hundred scientific documents.

Results: Ninety-two species were identified as valuable plants, highlighting their medicinal, food, cosmetic, and ritual uses. The highest percentage corresponded to native Andean species, 68%, and endemism reached 3.3%. Forty-nine botanical families were identified, with Fabaceae, Asteraceae, and Solanaceae standing out. The use of a significant number of plants is related to magical-religious practices.

Conclusion: This study reveals that even in large urban areas, pockets of plant biodiversity exist as small refuges that maintain a connection to life. These refuges can be utilized to enhance the health and well-being of city dwellers.

Keywords: Quito, Andean biodiversity, metropolitan parks, ancestral knowledge

Background

Quito, the capital of Ecuador, is the country's most populous city with 2,239,192 inhabitants according to the 2010 census (Population and Demography 2010). Located in the Andean region at an average altitude of 2850 m.a.s.l (Santillan & Villegas 2016), it lies very close to the equator at latitude 0° 4'S - 0° 20'S and longitude 78 25'W-78 33'W (Fernandez 1989). The metropolitan area includes the city of Quito, which accounts for about 82% of the population, and its rural parishes, which make up the remaining 18% (Municipality of the Metropolitan District of Quito 2006).

The city of Quito was founded in 1534 and is one of the most beautiful and best-preserved cities in Latin America. For this reason, it was granted the status of Cultural Heritage of Humanity by UNESCO in 1978 (Perlta & Moya 2003, Cifuentes 2008, Nun & Durán 2014).

In 1970, Quito had a population of 500,000 inhabitants. By 1990, its population had surpassed one million, and by the end of the decade, it was approximately two million (Municipality of the Metropolitan District of Quito 2006). Due to this growth, the city faces problems characteristic of extensive and conglomerate towns, such as mobility (Municipality of the Metropolitan District of Quito 2009), environmental quality (Metzger & Bermúdez 1996, Noriega *et al*. 2008), and excessive growth (Durán *et al*. 2013). Nevertheless, the city has several wildlife remnants protected by a system of metropolitan parks that maintain a population of native flora and fauna (Traves & Yanez 2016, Noguera Chacón 2012, Cobo 2012), which is very interesting for ethnobotanical studies.

In the Andean region of Ecuador, the ancestral use of medicinal plants to treat various diseases is common, as evidenced by several studies (Tene *et al*. 2007, Rios *et al*. 2007, Cerón 2006, Bussmann & Sharon 2006, De la Torre *et al*. 2006, Kohn 1992).

This research catalogs the medicinal, food, and ritual plants found in five metropolitan parks in Quito that still have high biodiversity forest areas. The aim of this study is to demonstrate the importance of preserving natural spaces within large cities and to encourage city residents to learn about the ancestral use of medicinal plants to treat many ailments and diseases.

Materials and Methods

Collection and inventory of medicinal plants

For this study, the five largest metropolitan parks that maintain areas of native flora were selected. Table 1 shows the geographic characteristics of each park, and Figure 1 shows their location within the Quito metropolitan area.

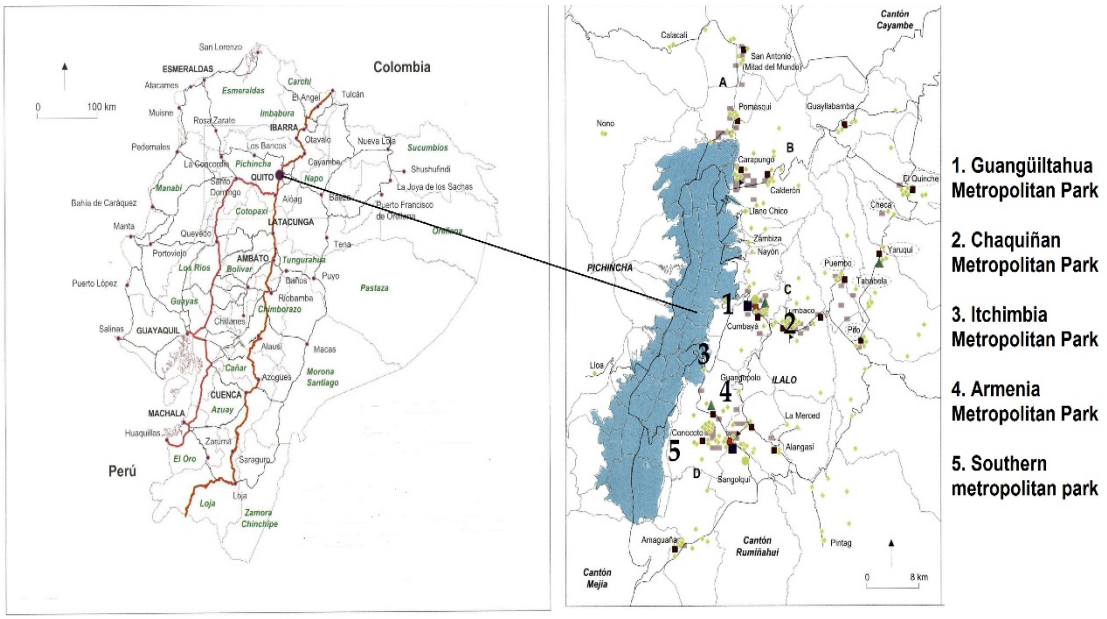

Figure 1. Localization of Metropolitan Parks of Quito

Table 1. Geographic characteristics of the metropolitan parks of Quito (Metropolitan Public Company of Mobility and Public Works 2021)

Park	Central location	Size (Ha)	Section of the city
Guangüiltahua metropolitan park	0°10'34.5"S 78°27'46.5"W	572	northeast
La Armenia metropolitan park	0°16'11.2"S 78°28'09.5"W	48	southeast
Southern metropolitan park	0°18'57.6"S 78°30'34.6"W	750	southeast
Itchimbia metropolitan park	0°13'19.9"S 78°29'56.1"W	54	Cyti center
Chaquiñan trail metropolitan park	0°11'36.0"S 78°22'25.2"W	The path extends for 22 km	East (Cumbaya and Tumbaco)

The expeditions to collect and catalog the species were conducted from March to July 2017. The plants were identified in the herbarium of the Pontifical Catholic University of Ecuador and then taken to the herbarium of the Life Sciences laboratories of the Polytechnic Salesian University. To collect ethnobotanical information, we had six informants knowledgeable in natural and ancestral medicine who described the different medicinal, food, cosmetic, and ritual uses of the species found, as shown in Table 2.

Table 2. Names and Characteristics of the Ethnobotanical use informants.

Name	Gender	Ethnicity	People	Nationality
Alberto Taxo Taco Chicaiza	male	indigenous	Andean Quichua	Panzaleo
Patricia del Carmen Noriega Rivera	female	mestizo	Andean mestizo	Mestizo
Sinchi Yachac Chimba Santillán	male	indigenous	Andean Quichua	Otavalo
María Laura Santillán Santillán	female	indigenous	Andean Quichua	Otavalo
José Marcos Pichazaca	male	indigenous	Shuar	Cañari
Patricia Elizabeth Peréz Duque	female	mestizo	Andean mestizo	Mestizo

Ethnobotany of species

The traditional uses of the plants were investigated considering two sources. The first source includes data obtained verbally from six informants under the leadership of Yachay Taita Alberto Taxo Taco Chicaiza during the collection and identification expeditions, figure 2 shows a pictures collage of metropolitan parks and the recollection expeditions. These data were later compiled in the text “La Flora Medicinal de los Parques del Distrito Metropolitano de Quito” (Noriega & Taco 2018). The second source was the consultation of scientific literature on ethnobiology and ethnobotany in the Ecuadorian and South American Andean regions.

Analysis of results

As is commonly done in ethnobotanical research, the data were classified according to their medicinal properties (Uprety *et al*. 2010, Giovannini 2015, Issa *et al*. 2018). For the classification, pharmacological properties such as analgesic, healing, digestive, disinfectant of the respiratory system, febrifuge, liver and kidney protector, purifying, etc., were considered. Plants used for energetic baths and hallucinogenic ritual plants were also evaluated because although they do not have medicinal use, they play an essential role in Andean ancestral phytotherapy.

In addition, the plants were classified according to their botanical family and their endemic, native, or introduced origin. Several plants were also classified as sacred.

Figure 2. Pictures collage of the collection expeditions in metropolitan parks of Quito. A) Guangüiltahua metropolitan park, B) La Armenia metropolitan park, C) Itchimbia metropolitan park, D) Southern metropolitan park and E) Chaquiñan trail metropolitan park

Results

In the five metropolitan parks of Quito, 92 ethnobotanical species with medicinal, food, cosmetic and ritual uses have been identified. Most species are used for medicinal purposes, as shown in Figure 3. Plants with anti-inflammatory properties 14.1 % and those used for digestive problems are the most common 14.1%, while species used for respiratory diseases 10.9 % and those related to women's care 6.5 % account for a significant number of species.

Cosmetic and food uses also represent a good percentage 7.6 % (respectively) of the plants studied here. It is also interesting to note that a considerable number of species are used for ritual purposes, as entheogens 6.5 % or in purification ceremonies 5.4%.

Detailed information about the use of each species is shown in Table 3, the data were collected with the help of informants.

The most abundant botanical family was the Fabaceae family with ten species, followed by Asteraceae with nine, Solanaceae with six, Rosaceae and Lamiaceae with four each, Araliaceae, Malvaceae, Piperaceae, and Verbenaceae with three each, and other families with two or one species. A total of 49 botanical families were found, as shown in Figure 4.

An interesting aspect of the study is that most of the plants are Andean natives, with 57 species equivalent to 62%, while the 35 species of plants introduced from other places represent 38%. Three species of native plants were categorized as endemic: *Clinopodium tomentosum* (Kunth) Govaerts, *Oreopanax ecuadorensis* Seem., and *Racinea pseudotetrantha* (Gilmartin & H. Luther) J.R. Grant. This result represents 3.3% endemism, as shown in Figure 5.

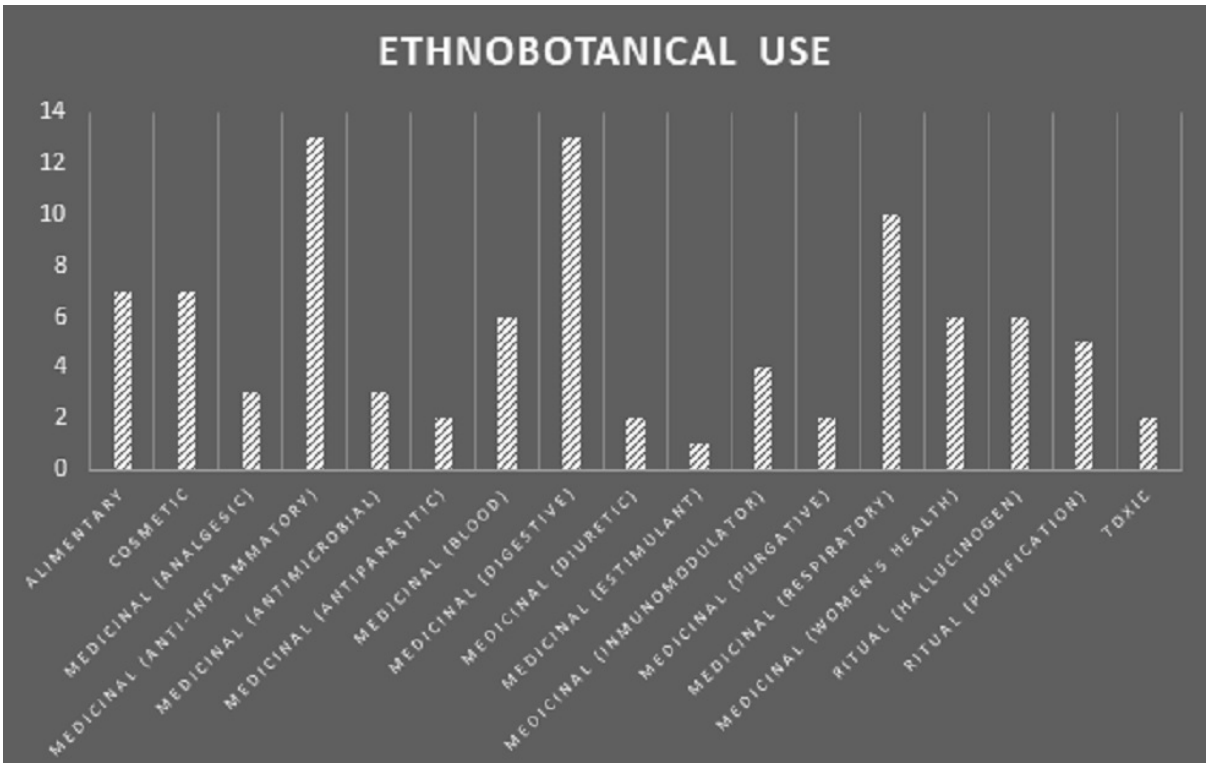

Figure 3. Traditional uses of medicinal plants from the metropolitan parks

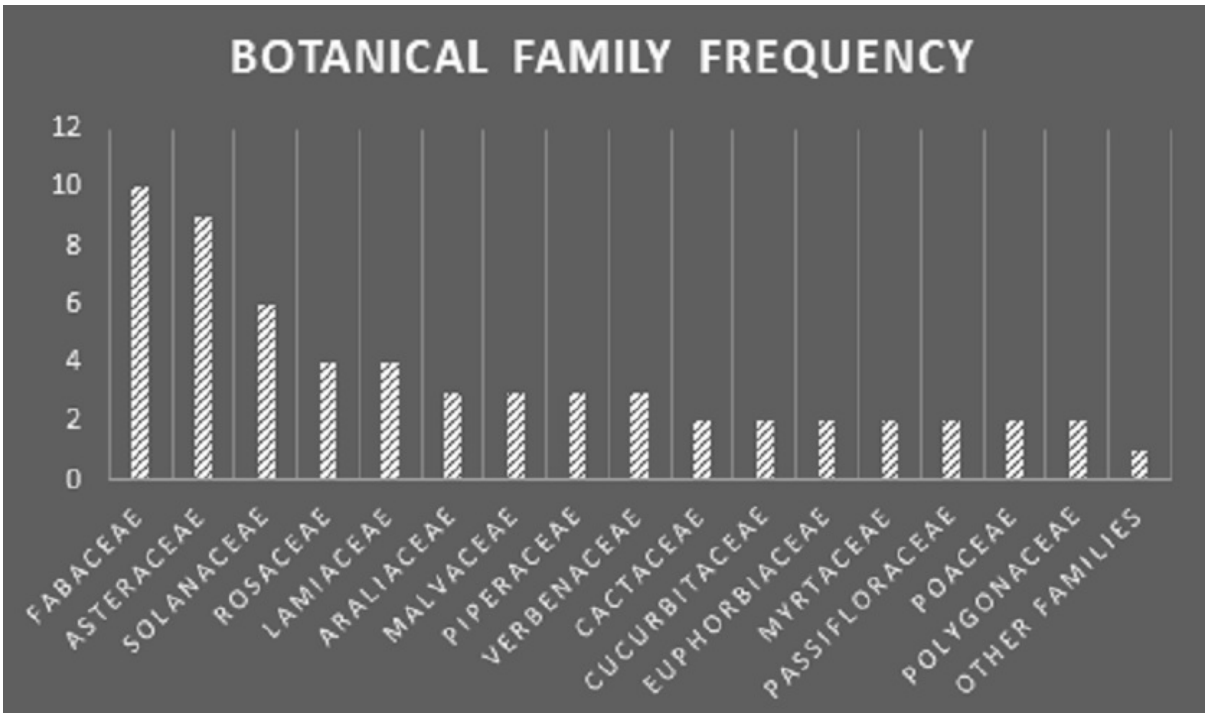

Figure 4. Botanical families most representative in the metropolitan parks

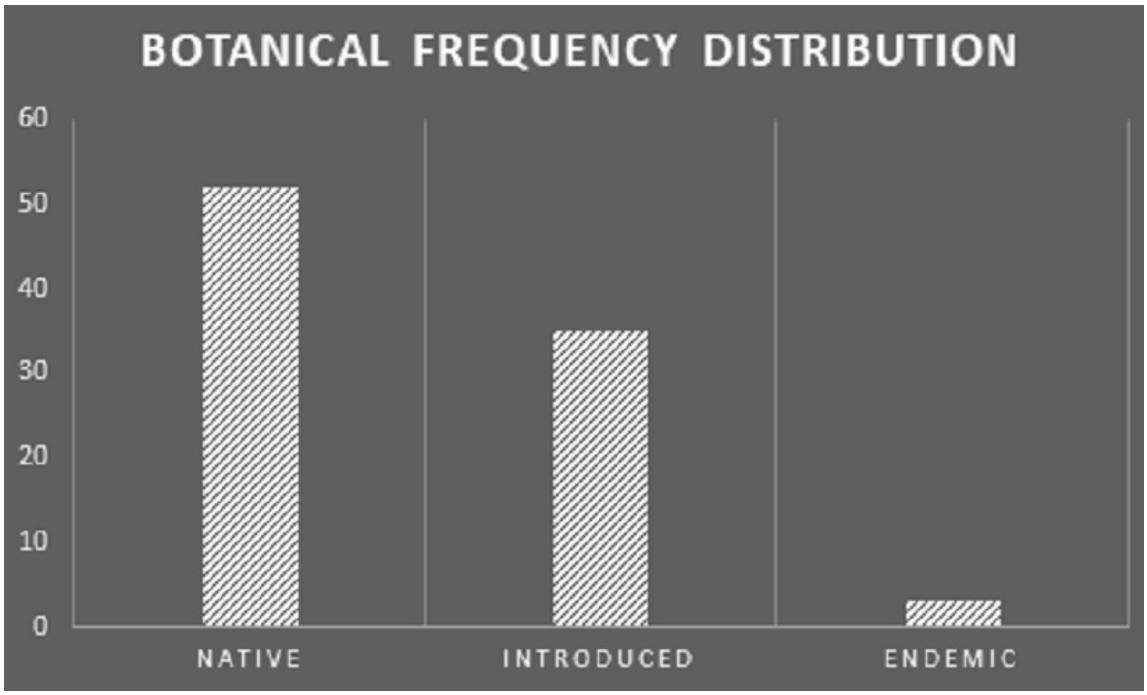

Figure 5. Classification of plants depending on their origin

In traditional Andean medicine, many native plants are used as part of therapies that are not necessarily conventional medicine. The use of these plants is related to magical-religious concepts, where the use of hallucinogenic or protective plants is prevalent. A total of eleven native plants are used in magic rituals, purification baths to ward off spirits and bad energies, etc., as shown in Figure 6.

Figure 6. Ritual and hallucinogen native plants. A) *Ambrosia peruviana* (**Marco**), B) *Baccharis latifolia* (**Chilca**), C) *Brugmasia arbórea* (**Guanto, Floripondio**), D) *Coriaria ruscifolia* (**Shanshi**), E) *Echinopsis pachanoi* (**San Pedro**), F) *Oreopanax ecuadorensis* (**Pumamaki**), G) *Peperomia fruticetorum* (**Congona**), H) *Peperomia galioides* (**Congona**), I) *Prunus serotina* (**Capulí**), J) *Rubus glaucus* (**Mora andina**), K) *Schinus molle* (**Molle**), L) *Solanum sisymbriifolium* (**uvilla roja**)

Table 3. Medicinal, Cosmetic, Alimentary and ritual Plants inside the metropolitan's parks of Quito.
Location: [a]Guangüiltagua metropolitan park, [b]Chaquiñan metropolitan park, [c]Itchimbia metropolitan park, [d]Armenia metropolitan park and [e]Southern metropolitan park.

Common name	Scientific name	Family	Medicinal, cosmetic, food and ritual uses	Used parts	Preparation	Way of use	Distribution	Voucher numbers
Acacia	*Vachellia macracantha* (Humb. & Bonpl. ex Willd.) Seigler & Ebinger. [a, c, d, e]	Fabaceae	Purgative (Noriega & Taco 2018)	Seeds	Direct use	Direct ingestion	Native	HUPS-3897
Achokcha	*Cyclanthera pedata* (L.) Schrad. [c]	Cucurbitaceae	(Noriega & Taco 2018)	fruits	Direct use	Direct ingestion	Native	HUPS-132
Ackchapack	*Palicourea amethystina* (Ruiz & Pav.) DC. [c]	Rubiaceae	Strengthen hair (Noriega & Taco 2018)	Bunch of flowers	Aqueous infusion	Rinse	Native	HUPS-125
Alfalfa	*Medicago lupulina* L. [a, b, c]	Fabaceae	Anemia, antidiabetic (Oleszek *et al*. 2008)	Whole plant	Juice	Drink	Introduced	HUPS-1001
Alfalfa	*Medicago sativa* L. [b, c]	Fabaceae	Anemia and hemorrhages (Noriega & Taco 2018)	Inmatured stems	Aqueous infusion	Drink	Introduced and cultivated	HUPS-3063
Aliso	*Alnus acuminata* kunth. [a,c,e]	Betulaceae	Analgesic and anti-inflammatory (Tene *et al*. 2007)	Leaves	Cataplasm	Topical application	Native	HUPS-506
Allupa	*Piper barbatum* Kunth. [d]	Piperaceae	Vaginal infections, ritual baths, antimicrobial, analgesic, dermatitis, Cicatrizing (Salehi *et al*. 2019, Noriega *et al*. 2020)	Leaves and flowers	Aqueous infusion	Douching	Native	HUPS-221
Angoyuyo	*Muehlenbeckia tamnifolia* (Kunth) Meisn. [c, d]	Polygonaceae	Anti-inflammatory (Noriega & Taco 2018)	Branches	Decoction	Cataplasm	Native	HUPS-348
Anís de tierra, ashpa anis	*Tagetes filifolia* Lag. [a, e]	Asteraceae	Digestion diseases, appetite stimulating and diuretic (Neher 1968)	Whole plant	Aqueous infusion	Drink	Native	HUPS-473
Arrayán de Quito	Myrcianthes hallii (O. Berg) McVaugh. [d]	Myrtaceae	Buccal antiseptic (Cerón 2006)	Leaves	Direct use	Eat	Native	HUPS-523
Ashku guañuña	*Bomarea multiflora* (L. f.) Mirb. [b,d]	Alstroemeriaceae	Toxic plant (Noriega & Taco 2018)	Flowers and fruits	Direct use	Direct ingestion	Native	HUPS-1014

Ashpa Kiwa	*Cynodon dactylon* (L.) Pers. [a]	Poaceae	Digestion diseases Alimentary (Noriega & Taco 2018)	Dried roots	Decoction	Drink	Introduced Alimentary	HUPS-781
Azafrán	*Crocosmia × crocosmiiflora* (Lemoine) N.E. Br. [a, e]	*Crocosmia × crocosmiiflora* (Lemoine) N.E. Br. Iridaceae	Analgesic, anticancer (Perveen *et al*. 2019)	Flowers	Infusion	Drink	Introduced	HUPS-3055
Berro	*Nasturtium officinale* W.T. Aiton. [b]	Brassicaceae	Anemia, Diuretic and antidiabetic (Sadeghi *et al*. 2013)	Leaves	Direct use	Direct ingestion	Introduced and cultivated	HUPS-3037
Capulí	*Prunus salicifolia* Kunth. [a, c, d, e]	Rosaceae	Bad energies, Alimentary (Luna-Vázquez *et al*. 2013)	Leaves, fruits	Aqueous infusion,direct use	Drink, eat	Native	HUPS-838
Cardo	*Cirsium vulgare* (Savi) Ten. [d]	Asteraceae	Prostate anti- inflammatory, diuretic and astringent (Kozyra & Glowniak 2013)	Leaves and flowers	Aqueous infusion	Drink	Introduced	HUPS- 2936
Chamana	*Dodonaea viscosa* Jacq. [b]	Sapindaceae	Digestion diseases (Noriega & Taco 2018)	Leaves and flowers	Aqueous infusion	Drink	Native	HUPS-1426
Chamburo	*Vasconcellea pubescens* A. DC. [c, d]	Caricaceae	Respiratory diseases and alimentary (Noriega *et al*. 2014)	Fruits	Cataplasm, direct use	Topical application, eat	Native and cultivated	HUPS-542
Chamico	*Datura stramonium* L. [b]	Solanaceae	Hallucinogen (Evans & Hofmann 1979)	Leaves	Aqueous infusion	Drink	Introduced	HUPS-953
Chilca blanca	*Baccharis latifolia* (Ruiz & Pav.) Pers. [a,c,d,e]	Asteraceae	Antitumor, analgesic, fractures, bad wind (Tene *et al*. 2007)	Leaves	Direct use	Topical application	Native	HUPS-623
Chilca negra	*Ligustrum vulgare* L. [a, b, c, d, e]	Oleaceae	Analgesic and anti-inflammatory (Pieroni & Pachaly 2000)	Leaves	Cataplasm	Topical application	Introduced and cultivated	HUPS- 841
Chocho Silvestre	*Lupinus pubescens* Benth.	Fabaceae	Appetite stimulating, antimicrobial (Harborne *et al*. 1976)	Flowers	Direct use	Eat	Native	HUPS-2543
Cola de caballo	*Equisetum arvense* Juss. ex Lam. [b]	Equisetaceae	Diuretic, anti-inflammatory (Li *et al*. 2009)	Leaves	Aqueous infusion	Drink	Introduced	HUPS-4442
Congona	*Peperomia fruticetorum* C. DC. [d]	Piperaceae	Energy baths (Noriega & Taco 2018)	Whole plant without roots	Aqueous infusion	Rinse	Native	HUPS-2613
Congona	*Peperomia galioides* Kunth. [d, e]	Piperaceae	Bad energies (Noriega & Taco 2018)	Branches	Living plant	Plant in the garden and topical application	Native	HUPS-3900

Dormilona	*Mimosa albida* Humb. & Bonpl. ex Willd. [a, b, c, d]	Fabaceae	Blood purifier, kidney diseases and Immunostimulatory (Noriega & Taco 2018)	Flowers	Aqueous infusion	Drink	Native	HUPS-102
Dulcamara	*Kalanchoe daigremontiana* Raym.-Hamet & H. Perrier. [a, b, d]	Crassulaceae	Immunostimulatory (Supratman *et al*. 2001)	Leaves	Direct use	Chew	Introduced and cultivated	HUPS-210
Eneldo	*Foeniculum vulgare* Mill. [c]	Apiaceae	Menstrual pain, Digestion diseases, kidney diseases, appetite stimulating (Rather *et al*. 2016, Badgujar *et al*. 2014)	Leaves and branches	Aqueous infusion	Drink	Introduced	HUPS-1125
Equinacea	*Echinacea purpurea* (L.) Moench. [b, d]	Asteraceae	Immunostimulatory (Barrett 2003)	Flowers	Aqueous infusion and extraction	Drink	Introduced	HUPS-359
Escancel	*Aerva sanguinolenta* (L.) Blume. [a,b]	Amaranthaceae	Affections of kidneys and liver, febrifuge, anti-inflammatory (Sumei *et al*. 2006), diuretic and demulcent (Adhikari el al. 2010), galactagogue (Buragohain 2008), anthelmintic (Kosalge & Fursule 2009)	Leaves	Aqueous infusion	Drink and topical application	Introduced and cultivated	HUPS-1028
Eucalipto	*Eucalyptus globulus* Labill. [a, c, d, e]	Myrtaceae	Respiratory diseases (Noriega & Taco 2018)	Leaves	Aqueous infusion	Drink	Introduced and cultivated	HUPS-2030
Gordolobo	*Verbascum phlomoides* L. [e]	Scrophulariaceae	Respiratory diseases, vaginal and urinary infections and anti-inflammatory (Grigore *et al*. 2013)	Flowers and leaves	Decoction	Drink	Introduced	HUPS-3869
Granadilla	*Passiflora ligularis* Juss. [b, d]	Passifloraceae	Digestion diseases in children, circulatory system diseases (Castañeda *et al*. 2019)	Fruits	Aqueous infusion	Drink	Native and cultivated	HUPS-805
Guaba	*Inga edulis* Mart. [a, b]	Fabaceae	Alimentary (Noriega & Taco 2018)	Fruits	Direct use	Direct ingestion	Native and cultivated	HUPS-712
Guanto rojo, floripondio	*Brugmansia arbórea* (L.) Lagerh. [c]	Solanaceae	Sacred and hallucinogen plant (Evans & Hofmann 1979)	Flowers	Direct use	Rub on the body, drink	Native and cultivated	HUPS-1340

Guarango	*Caesalpinia spinosa* (Feuillée ex Molina) Kuntze. [b]	Fabaceae	Anemia, antibacterial and astringent (Avilés *et al*. 2010)	Sheath	Aqueous infusion	Drink	Native	HUPS-2489
Hiedra	*Hedera helix* L. [a, c, d]	Araliaceae	Respiratory diseases (Lutsenko *et al*. 2010)	Leaves	Aqueous infusion	Drink	Introduced and cultivated	HUPS-3007
Hierba de gato	*Nepata cataria* L. [b]	Lamiaceae	Antiparasitic, sedative (Modnicki *et al*. 2007)	Leaves	Direct use	Direct ingestion	Introduced and cultivated	HUPS-1274
Huaicundo	*Racinea pseudotetrantha* (Gilmartin & H. Luther) J.R. Grant. [a, e]	Bromeliaceae	Anemia (Noriega & Taco 2018)	Leaves	Aqueous decoction	Drink	Endemic	HUPS-723
Jaboncillo	*Phytolacca icosandra* L. [b]	Phytolacceae	Antibacterial and antifungal in hair (Noriega & Taco 2018)	Fruits	Cataplasm	Topical application	Native	HUPS-976
Kasha marusha	*Argemone mexicana* L. [b]	Papaveraceae	Prostate anti-inflammatory, antidote to snake venom (Bhattacharjee *et al*. 2006), antimalarial (Willcox *et al*. 2007), ulcer and cutaneous affections (Manjamalai *et al*. 2010)	Leaves and flowers	Aqueous infusion	Drink	Introduced	HUPS-606
Laurel andino	*Morella pubescens* (Humb. & Bonpl. ex Willd.) Wilbur. [e]	Myricaceae	Appetite stimulating, digestion diseases and respiratory diseases (Sandoval *et al*. 2020)	Leaves	Aqueous infusion	Drink	Native	HUPS-4466
Lechero	*Euphorbia laurifolia* Juss. ex Lam. [a, c]	Euphorbiaceae	Anti-warts (Noriega & Taco 2018)	Latex from leaves	Direct use	Topical application	Native	HUPS-308
Lechero rojo	Euphorbia cotinifolia L. [b]	Euphorbiaceae	Anti-warts (Noriega & Taco 2018)	Latex from leaves	Direct use	Topical application	Introduced and cultivated	HUPS-1214
Lengua de vaca	*Rumex obtusifolius* L. [a, c, e]	Polygonaceae	Analgesic, anti-inflammatory (Kupeli *et al*. 2007)	leaves	Direct use	Topical application	Introduced	HUPS-459
Llantén	*Plantago major* L. [a, c, d, e]	Plantaginaceae	Anti-inflammatory, analgesic, liver diseases, kidney diseases (Mozaffari *et al*. 2013)	Whole plant	Aqueous infusion	Drink	Introduced	HUPS-1597
Llin llin	*Tecoma stans* (L.) Juss. ex Kunth. [c, d]	Bignoniaceae	Vaginal infections and antidiabetic (Lozoya-Meckes & Mellado-Campos 1985)	Flowers	Aqueous infusion	Topical application	Native and cultivated	HUPS-1327
Madre selva	*Solanum americanum* Mill. [d]	Solanaceae	Fragance (Noriega & Taco 2018)	Flowers	Aqueous infusion	Topical aplication	Native	HUPS-3866

Malva rosada	*Malva arborea* (L.) Webb & Berthel. [c]	Malvaceae	Digestion diseases, kidney diseases and blood purifier (Von Schoen-Angerer *et al*. 2016)	Flowers	Aqueous infusion	Drink	Introduced and cultivated	HUPS-56
Marco	*Ambrosia arborescens* Willd. [b,c]	Asteraceae	Antihelmintic, Insecticide (Correa & Bernal 1990), body purification (Morales *et al*. 2017), sacred purification ceremonies (Cavender & Albán 2009)	Leaves	Aqueous infusión and direct contact	Drink	Native	HUPS-70
Matico blanco	*Sida rhombifolia* L. [a, c, d, e]	Malvaceae	Liver diseases, kidney diseases, dysentery and anti-inflammatory (Dinda *et al*. 2015)	Leaves	Aqueous infusion	Drink	Native	HUPS-3956
Molentín	*Petiveria alliacea* L. [a]	Petiveriaceae	Anti-inflammatory, analgesic, respiratory diseases, diabetes (Rajesh *et al*. 2019)	Leaves	Cataplasm, Aqueous infusion	Topical application, Drink	Native	HUPS-2331
Molle	*Schinus molle* L. [a, b, c, e]	Anacardiaceae	Bad energies, insecticide, purgative and diuretic (Goldstein & Coleman 2004)	leaves	Direct used	Direct aplication	Native	HUPS-48
Mora de castilla	*Rubus glaucus* Benth. [a, c, d, e]	Rosaceae	Febrifuge, bad energies, alimentary (Alarcón-Barrera *et al*. 2018)	Flowers, fruits and seeds	Direct use and aqueous infusion	Drink and topical application	Native and cultivated	HUPS-2903
Mote Kasha	*Duranta triacantha* Juss. [c, d, e]	Verbenaceae	Respiratory diseases, skin deseases (De la Torre *et al*. 2008)	Leaves	Direct use	Chew	Native	HUPS-1458
Niguas, Pikillullu	*Margyricarpus pinnatus* (Lam.) Kuntze. [a, e]	Rosaceae	Anticancer, anti-inflammatory, diuretic (Sosa *et al*. 2007) and Respiratory diseases (Cerón 2006)	Fruits	Aqueous infusion, cataplasm	Drink, Topical application	Native	HUPS-96
Nispero	*Eriobotrya japonica* (Thunb.) Lindl. [b, c, d]	Rosaceae	Analgesic and anti-inflammatory prostate, asthma (Adhikari *et al*. 2010)	Fruits	Direct use	Direct ingestion	Introduced and cultivated	HUPS-4457
Nogal	*Juglans regia* L. [e]	Juglandaceae	Menstrual pain, Alimentary (Hosseinzadeh *et al*. 2011)	Fruits and leaves	Direct use, Aqueous infusion	Eat and Drink	Native and cultivated	HUPS-84

Ñachag	*Bidens andicola* Kunth. [b,c,e]	Asteraceae	Vaginal infections and contraceptive, diuretic, Affections of kidneys and liver (Vinueza *et al*. 2017)	Leaves	Aqueous infusion	Topical application	Native	HUPS-986
Ortiga	*Urtica laetevirens* Maxim. [b]	Urticaceae	Bad energies, blood purifier and anti-inflammatory (Zhou *et al*. 2009)	Leaves	Direct use, Aqueous infusion	Topical application, drink	Introduced	HUPS-760
Pega pega, amores secos	*Desmodium mollicum* (kunt) DC. [a, e]	Fabaceae	Healing and love baths (Noriega & Taco 2018)	Leaves and sedes	Aqueous infusion	Drink	Native	HUPS-658
Penco azul	*Agave americana* L. [a,b,e]	Asparagaceae	Rheumatism, blood purifier, energizing and anti-inflammatory (Peana *et al*. 1997)	Leaves and stems	Sap extraction	Direct ingestion	Introduced and cultivated	HUPS-1114
Pino	*Casuarina equisetifolia* J.R. Forst. & G. Forst. [a,d,e]	Casuarinaceae	Respiratory diseases and energy baths (Noriega & Taco 2018)	Leaves	Decoction	Drink, bath	Introduced and cultivated	HUPS-327
Pumamaki	*Oreopanax ecuadorensis* Seem. [a, c, d, e]	Araliaceae	Sacred Plant and Antifungal (Noriega *et al*. 2019)	Leaves and bark	Living plant, aqueous infusion	Plant in the garden, shower	Endemic and cultivated	HUPS-139
Retama	*Spartium junceum* L. [e]	Fabaceae	Digestion diseases (Bucciarelli & Skliar 2007) and respiratory diseases (Noriega & Taco 2018)	Flowers	Aqueous infusion	Drink	Introduced	HUPS-182
Ricunku	*Ipomoea purpurea* (L.) Roth. [b]	Convolvulaceae	Hallucinogen (Noriega & Taco 2018)	Flowers	Aqueous infusion	Drink	Native and cultivated	HUPS-718
Saccha naranjilla	*Solanum quitoense* Lam. [a]	Solanaceae	Dandruff and alimentary (Gancel el at. 2008)	Fruits	Fruits , fruits powder	Eat. topical application	Native and cultivated	HUPS-119
San Pedro	*Echinopsis pachanoi* (Britton & Rose) Friedrich & G.D. Rowley. [d]	Cactaceae	Hallucinogen and Sacred Plant (Evans & Hofmann 1979)	Whole plant	Decoction	Drink	Native	HUPS-607
Santa María	*Tanacetum parthenium* (L.) Sch. Bip. [a]	Asteraceae	Ritual baths, fever, analgesic and anti-inflammatory (Pareek *et al*. 2013)	Whole plant without roots	Aqueous infusion	Rinse	Introduced	HUPS-2207

Sarzamora, sarsaparilla	*Smilax aspera* L. [c]	Smilacaceae	Blood purifier, respiratory diseases, eczema and anti-inflammatory (Delgado-Pelayo & Hornero-Méndez 2012)	Flowers	Aqueous infusion	Drink	Introduced	HUPS-207
Sauco	*Sambucus nigra* L. [a, c, d]	Adoxaceae	Anti-inflammatory, respiratory diseases, diuretic and laxative (Charlebois 2007)	Leaves and fruits	Direct use and aqueous infusion	Drink and topical application	Introduced and cultivated	HUPS-998
Shanshi	*Coriaria ruscifolia* L. [a, e]	Coriariaceae	Sacred and hallucinogen plant (Evans & Hofmann 1979)	Fruits	Direct use	Direct ingestion	Native	HUPS-3096
Sigse	*Cortaderia selloana* (Schult. & Schult. f.) Asch. & Graebn. [a, b, c, e]	Poaceae	Cicatrizing, diuretic (Hernández *et al*. 2015)	Leaves	Leaf ashes	Topical application	Native	HUPS-562
Sigui, liso	*Dalea coerulea* (L. f.) Schinz & Thell. [a,b,c,e]	Fabaceae	Respiratory diseases (De la Torre *et al*. 2008)	Flowers	Aqueous infusion	Drink	Native	HUPS-1119
Suelda, Muccu Nanikpak	*Commelina diffusa* Burm. F. [d]	Commelinaceae	Analgesic, anti-inflammatory and fractures (Malarvizhi *et al*. 2019)	Leaves	Cataplasm	Topical application	Native	HUPS-2957
Supirosa	*Lantana camara* L. [a, b]	Verbenaceae	Insecticide (Noriega & Taco 2018)	Whole plant	Living plant	Plant in the garden	Introduced and cultivated	HUPS-362
Taraxaco, diente de león	*Taraxacum officinale* F.H. Wigg. [a, c, d, e]	Asteraceae	Kidney diseases (Ballabh *et al*. 2008) and liver diseases (Devaraj 2016)	Whole plant	Aqueous infusion	Drink	Introduced	HUPS-3995
Taxo	*Passiflora tripartita* Breit. Hort. ex Steudel. [c, d]	Passifloraceae	Alimentary, kidney diseases and liver diseases (Castañeda *et al*. 2019)	Flowers and fruits	Direct use, Aqueous infusion	Drink and eat	Native and cultivated	HUPS-552
Té verde	*Camellia sinensis* L. Kuntze. [c]	Theaceae	Stimulating, stomachic (Namita *et al*. 2012)	Leaves	Aqueous infusion	Drink	Introduced and cultivated	HUPS-2924
Tiglan	*Clinopodium tomentosum* (Kunth) Govaerts. [b]	Lamiaceae	Increase uterine contractions (Noriega & Taco 2018)	Flowers	Aqueous infusion	Drink	Endemic	HUPS-1116
Tilo	*Tilia platyphyllos* Scop. a, b, c, d	Malvaceae	Respiratory diseases (Bulut & Tuzlaci 2013)	Cough	Flowers	Aqueous infusion	Introduced	HUPS-1222
Tipo	Minthostachys mollis var. hybrida Schmidt-Leb [d]	Lamiaceae	Respiratory diseases, insecticide and antimicrobial (Linares 2020)	Leaves	Aqueous infusion	Drink	Native	HUPS-601

Trebol redondo	*Hydrocotyle bonplandii* A. Rich. [d, e]	Araliaceae	Febrifuge, Immunostimulatory (Noriega & Taco 2018)	Leaves	Aqueous infusion	Drink	Native	HUPS-3898
Trinitaria	*Monnina phillyreoides* (Bonpl.) B. Eriksen. [a, c, d, e]	Polygalaceae	Febrifuge and digestion diseases (Noriega & Taco 2018)	Branches	Aqueous infusion	Drink	Native	HUPS-1975
Tuna	*Opuntia ficus-indica* (L.) Mill. [b]	Cactaceae	Pancreas diseases,antidiabetic (Díaz *et al*. 2010)	Fruits and leaves	Direct use	Direct ingestion	Native	HUPS-780
Tzinsu	*Tagetes multiflora* Kunth. [b]	Asteraceae	Antiparasitic (Noriega & Taco 2018)	Leaves	Direct use	eat	Native	HUPS-1106
Uvilla	*Physalis peruviana* L. [a, b, c, d]	Solanaceae	Blood purifier, anti-inflammatory, nutritional (Akhtar *et al*. 2019)	Leaves	Aqueous infusion	Drink	Native and cultivated	HUPS-444
Uvilla roja	*Solanum sisymbriifolium* Lam. [b]	Solanaceae	Hallucinogen and fertility (Arenas & Azorero 1977)	Fruits, leaves	Aqueous decoction	Drink	Native	HUPS-1984
Verbena	*Verbena litoralis* Kunth. [d]	Verbenaceae	Digestion diseases, appetite stimulating and respiratory diseases (Cerón 2006)	Branches and leaves	Aqueous infusion	Drink	Native	HUPS-569
Verdolaga	*Portulaca oleracea* L. [b]	Portulacaceae	Liver diseases, diabetes and kidney diseases (Iranshahy *et al*o. 2017)	Leaves	Direct use	Direct ingestion	Native	HUPS-3091
Yanga	*Salvia scutellariodes* Kunth.	Lamiaceae	Respiratory diseases, cosmetic uses and healing (Cerón 2006)	flowers	Direct use	eat	Native	HUPS-3800
Zambo	*Cucurbita ficifolia* Bouché. [c, d]	Cucurbitaceae	Antihelmintic (Noriega & Taco 2018)	seeds	Direct use	Direct ingestion	Introduced	HUPS-1529

Conclusion

Green areas in cities are significant natural spaces that directly affect people's health and air quality. This study was carried out in Quito, where approximately one hundred plants were identified as useful to humans. The results demonstrate the importance of biodiversity remnants in large cities because, despite the growth of cities worldwide, it is still possible to collect information about their biological resources. A noteworthy aspect of this study is that the highest percentage of species identified (62%) correspond to native flora, indicating that the metropolitan parks have biodiversity that predates the Spanish founding of the city. Introduced species (38%) result from a systematic entry of plants from other parts of the world since the 16th century due to the biological exchange between Europe and America.

By working with experts in Andean phytotherapy, we preserve and disseminate the ancestral knowledge of native informants from indigenous peoples and those belonging to the mestizo context, whose knowledge results from the cultural exchange of the last 500 years.

The largest number of species found are used for medicinal purposes 70.7%, followed by plants used for ritual purposes 12%. This information was corroborated through a bibliographic search that allowed us to identify the different uses of these species of urban flora.

In addition to being an important academic document, this research can also serve as a guide for using plant species to benefit the city's inhabitants and promote well-being and health.

Declarations

List of abbreviations: Not applicable
Ethics approval and consent to participate: The authors asked for permission from the local authorities and the people interviewed to carry out the study.
Consent for publication: The people interviewed were informed about the study's objectives and the eventual publication of the information gathered.
Availability of data and materials: Please contact the corresponding author for data requests.
Competing interests: The authors declare that they have no competing interests
Funding: Research funding Polytechnic Salesian University, project, "Research of Biodiversity and Ethnobotanical Resources from Metropolitan Parks of Quito"
Author contributions: PN and LC Administrative and scientific management of the project, ATT coordination of field work with informants, PCN Anthropology support, BM date tabulation, KJ date tabulation.

Acknowledgements

We are grateful to the informants for sharing their knowledge with us. We thank Tayta Alberto Taxo for knowhow and guidance in this experience.

Literature cited

Adhikari BS, Babu MM, Rawat GS, Saklani PL. 2010. Medicinal Plants Diversity and their Conservation Status in Wildlife Institute of India (WII) Campus, Dehradun. Ethnobotanical Leaflets 14:46-83.

Akhtar N, Amjad MS, Arshad S, Chaudhari SK, Fatima H. 2019. Biological Activities and Nutritional Value of *Physalis peruviana* L. In: Akhtar M, Swamy M, Sinniah U. (eds). Natural Bio-active Compounds. Singapore: Springer. Pp. 587-598. doi: 10.1007/978-981-13-7154-7_21

Alarcón-Barrera KS, Alvarez-Suarez JM, Armijos-Montesinos DS, García-Tenesaca M, Giampieri F, Granda-Albuja MG, Iturralde G, Jaramilo-Vivanco T. 2018. Wild Andean blackberry (*Rubus glaucus* Benth) and Andean blueberry (*Vaccinium floribundum* Kunth) from the Highlands of Ecuador: Nutritional composition and protective effect on human dermal fibroblasts against cytotoxic oxidative damage. Journal of Berry Research 8:223-236. doi: 10.3233/JBR-180316

Arenas P, Azorero R. 1977. Plants of common use in Paraguayan folk medicine for regulating fertility. Economic Botany 31: 298-300.

Avilés R, Carrión J, Huamán J, Bravo M, Rivera D, Rojas N, Santiago J. 2010. Antioxidant activity, total polyphenols and tannin content of extracts of tara, *Caesalpinia spinosa*. Peruvian Journal of Chemistry and Chemical Engineering 13:5-11.

Badgujar SB, Patel VV, Bandivdekar AH. 2014. *Foeniculum vulgare* Mill: a review of its botany, phytochemistry, pharmacology, contemporary application, and toxicology. BioMed Research International. doi: 10.1155/2014/842674

Ballabh B, Chaurasia OP, Ahmed Z, Singh SB. 2008. Traditional medicinal plants of cold desert Ladakh—used against kidney and urinary disorders. Journal of Ethnopharmacology 118:331-339. doi: 10.1016/j.jep.2008.04.022

Barrett B. 2003. Medicinal properties of Echinacea: a critical review. Phytomedicine 10:66-86. doi: 10.1078/094471103321648692

Bhattacharjee I, Chatterjee SK, Chatterjee S, Chandra G. 2006. Antibacterial potentiality of *Argemone mexicana* solvent extracts against some pathogenic bacteria. Memorias do Instituto Oswaldo Cruz 101:645-648. doi: 10.1590/S0074-02762006000600011

Bucciarelli A, Skliar MI. 2007. Plantas medicinales de Argentina con actividad gastroprotectora. Ars Pharmaceutica 48:361-369. doi: 10.30827/ars

Bulut G, Tuzlaci E. 2013. An ethnobotanical study of medicinal plants in Turgutlu (Manisa—Turkey). Journal of Ethnopharmacology 149: 633-647. doi: 10.1016/j.jep.2013.07.016

Buragohain J. Folk. 2008. Medicinal plants used in gynecological disorders in Tinsukia district, Assam, India. Fitoterapy 79:388-392. doi: 10.1016/j.fitote.2008.03.004

Bussmann RW, Sharon D. 2006.Traditional medicinal plant use in Loja province, Southern Ecuador. Journal of Ethnobiology and Ethnomedicine 2:44. doi:10.1186/1746-4269-2-44

Castañeda R, Gutiérrez H, Chávez G, Villanueva R. 2019. Ethnobotany of passion flowers (Passiflora) in the Andean province of Angaraes (Huancavelica, Peru). Latin American and Caribbean Bulletin of Medicinal and Aromatic Plants 18:27-41. doi: 10.35588/blacpma.19.18.1.03

Cavender AP, Albán M. 2009. The use of magical plants by curanderos in the Ecuador highlands. Journal of Ethnobiology and Ethnomedicine 5:3. doi: 10.1186/1746-4269-5-3

Cerón CE. 2006. Medicinal plants of the Ecuadorian Andes.In: Moraes M, Øllgaard B, Kvist LP, Borchsenius F, Balslev H. (eds). Economic Botany of the Central Andes. La Paz: University Major of San Andrés. Pp. 285-293.

Charlebois, D. 2007. Elderberry as a medicinal plant. In: Janick J, Whipkey A, (eds). Issues in New Crops and New Uses. Alexandria; ASHS Press. p. 284-292.

Cifuentes C. 2008. The planning of heritage áreas in Quito. Centro-h: Journal of the Latin American Caribbean Organization of Historic Centers 1:101-114.

Cobo, W. 2012. Urban Forestry Development in Latin America. In: Palo M, Uusivuori J. (eds). World Forests. Dordrecht: Springer. Pp. 240-246. doi: 10.1007/978-94-011-4746-0_25

Correa JE. 1990. Especies vegetales promisorias de los países del Convenio Andrés Bello. Secretaría Ejecutiva Permanente del Convenio Andrés Bello, Bogotá, Colombia.

De la Torre L, Muriel P, Balslev H. 2006. Ethnobotany in the Andes of Ecuador. In: Moraes M, Øllgaard B, Kvist LP, Borchsenius F, Balslev H. (eds). La Paz: University Major of San Andrés. Pp. 246-267.

De la Torre L,Alarcón D, Kvist L, Salazar J. 2008.Medicinal uses of plants. In: De la Torre L, Navarrete H, Muriel P, Macía M, Balslev H. (eds). Encyclopedia of the useful plants of Ecuador. Quito, Aarhus: Herbario QCA & Herbario AAU. Pp. 105-114.

Delgado-Pelayo R, Hornero-Méndez D. 2012. Identification and quantitative analysis of carotenoids and their esters from sarsaparilla (*Smilax aspera* L.) berries. Journal of Agricultural and Food Chemistry 60:8225-8232. doi: 10.1021/jf302719g

Devaraj E. 2016. Hepatoprotective properties of Dandelion: recent update. Journal Applied Pharmaceutical Science 6:202-205. doi: 10.7324/JAPS.2016.60429

Díaz MC, Obón JM, Lozano M, Castellar MR. 2010. Health benefits of the fruits of *Opuntia spp.* Introduction to the UPCT research conference.

Dinda B, Das N, Dinda S, Dinda M, SilSarma I. 2015. The genus Sida L.–A traditional medicine: Its ethnopharmacological, phytochemical and pharmacological data for commercial exploitation in herbal drugs industry. Journal of Ethnopharmacology 176:135-176. doi: 10.1016/j.jep.2015.10.027

Durán G, Martí M, Mérida J. 2016. Growth segregation and displacement mechanisms in peri-urban Quito. Íconos 56:123-146.

Evans R, Hofmann A. 1979. Plants of the Gods. Origins of Hallucinogenic use. 1st ed. McGraw-Hill, New York, EEUU.

Fernández A. 1989. Quito: Growth and dynamics of an andean city. Geographic Journal 110:121-164.

Gancel AL, Alter P, Dhuique-Mayer C, Ruales J, Vaillant F. 2008. Identifying carotenoids and phenolic compounds in naranjilla (*Solanum quitoense* Lam. var. Puyo hybrid), an Andean fruit. Journal of Agricultural and Food Chemistry 56:11890-11899. doi: 10.1021/jf801515p

Giovannini P. 2015. Medicinal plants of the Achuar (Jivaro) of Amazonian Ecuador: Ethnobotanical survey and comparison with other Amazonian pharmacopoeias. Journal of Ethnopharmacolpgy 164: 78-88. doi: 10.1016/j.jep.2015.01.038

Goldstein DJ, Coleman RC. 2004, *Schinus molle* L.(Anacardiaceae) chicha production in the central Andes. Economic Botany 58:523-529.

Grigore A, Colceru-Mihul S, Litescu S, Panteli M, Rasit I. 2013. Correlation between polyphenol content and anti-inflammatory activity of *Verbascum phlomoides* (mullein). Pharmaceutical Biology 51: 925-929. doi: 10.3109/13880209.2013.767361

Harborne JB, Ingham JL, King L, Payne M. 1976. The isopentenyl isoflavone luteone as a pre-infectional antifungal agent in the genus *Lupinus*. Phytochemistry 51:1485-1487. doi: 10.1016/S00319422(00)88921-9

Hernández MP, Novoa MC, Arambarri AM, Oviedo MA. 2015. Medicinal and seasoning plants used in the southeast of Berisso (Buenos Aires, Argentina). Bonplandia 24(2):125-138.

Hosseinzadeh H, Zarei H, Taghiabadi E. 2011. Antinociceptive, anti-inflammatory and acute toxicity effects of *Juglans regia* L. leaves in mice Iran. Red Crescent Medical Journal 13:27-33.

Iranshahy M, Javadi B, Iranshahi M, Jahanbakhsh SP, Mahyari S, Hassani FV, Karimi G. 2017. A review of traditional uses, phytochemistry and pharmacology of *Portulaca oleracea* L. Journal of Ethnopharmacolog. 205:158-172. doi: 10.1016/j.jep.2017.05.004

Issa TO, Mohamed YS, Yagi S, Ahmed RH, Najeeb TM, Makhawi AM, Khider TO. 2018. Ethnobotanical investigation on medicinal plants in Algoz area (South Kordofan), Sudan. Journal of Ethnobiology and Ethnomedicine 14:31. doi: 10.1186/s13002-018-0230-y

Kohn EO. 1992. Some observations on the use of medicinal plants from primary and secondary growth by Runa of eastern lowland Ecuador. Journal of Ethnobiology 12:141-152.

Kosalge SB, Fursule RA. 2009. Investigation of ethnomedicinal claims of some plants used by tribals of Satpuda Hills in India. Journal of Ethnopharmacology 121:456-461. doi: 10.1016/j.jep.2008.11.017

Kozyra M, Glowniak K. 2013. Phenolic acids in extracts obtained from the flowering herbs of *Cirsium vulgare* (Savi) Ten. growing in Poland. Acta Societatis Botanicorum Poloniae 82(4): 325-329. doi: 10.5586/asbp.2013.039

Kupeli E, Orhan I, Yesilada E. 2007. Evaluation of some plants used in Turkish folk medicine for their anti-inflammatory and antinociceptive activities. Pharmaceutical Biology 45:547-555. doi: 10.1080/13880200701498895

Li SZ. Ben Cao Gang Mu. 2009. Compendium of Materia Medica. Beijing Yanshan Press, Beijing, China.

Linares MV. 2020. Considerations for the use and study of the Peruvian “muña” *Minthostachys mollis* (Benth.) Griseb and *Minthostachys setosa* (Briq.) Epling. Ethnobotany Research and Applications 19:1-9. doi: 10.32859/era.19.29.1-9

Lozoya-Meckes M, Mellado-Campos V. 1985; Is the *Tecoma stans* infusion an antidiabetic remedy? Journal of Ethnopharmacology 14:1-9. doi: 10.1016/0378-8741(85)90022-4

Luna-Vázquez FJ, Ibarra-Alvarado C, Rojas-Molina A, Rojas-Molina JI, Yahia EM, Rivera-Pastrana DM, Rojas-Molina A, Savala-Sánchez MA. 2013. Nutraceutical value of black cherry *Prunus serotina* Ehrh. fruits: antioxidant and antihypertensive properties. Molecules 18:14597-14612. doi: 10.3390/molecules181214597

Lutsenko Y, Bylka W, Matlawska I, Darmohray R. 2010. Hedera helix as a medicinal plant. Herba Polonica 56:83-96.

Malarvizhi D, Karthikeyan AVP, Sudan I, Satheeshkumar R. 2019. Phytochemical analysis of *Commelina diffusa* Burm. f. through GC-MS method. Journal of Pharmacognosy and. Phytochemistry 8:376-379.

Manjamalai A, Sardar Sathyajith singh R, Guruvayoorappan C, Berlin Grace VM. 2010. Analysis of phytochemical constituents and anti-microbial activity of some medicinal plants in Tamilnadu, India. Global. Journal of Biochemistry and Biotechnology 5:120-128.

Metropolitan Public Company of Mobility and Public Works. 2021. Report on multi-year investment projects for the period 2021-2024.Main Report. http://www.epmmop.gob.ec/epmmop/. (Accessed 6 March 2023).

Metzger P, Bermúdez N. 1996. The urban environment in Quito. Municipality of the Metropolitan District of Quito, General Directorate of Planning, Quito, Ecuador.

Modnicki D, Tokar M, Klimek B. 2007. Flavonoids and phenolic acids of *Nepeta cataria* L. var. citriodora (Becker) Balb.(Lamiaceae). Acta Pololiae Pharmaceutica 64:247-252.

Morales F, Padilla S, Falconí F. 2017. Medicinal plants used in traditional herbal medicine in the province of Chimborazo, Ecuador. African Journal of Traditional, Complementary and Alternative Medicines 14:10-15. doi: 10.21010/ajtcam.v14i1.2

Mozaffari A, Kamkar A, Giri A, Pourmahmoudi AA. 2013. Ethnobotany and folk medicinal uses of major trees and shrubs in Northern Iran. Journal of Medinal. Plants Research 7:284-289. doi: 10.5897/JMPR11.680.

Municipality of the Metropolitan District of Quito. 2006. General Plan of Territorial Development of MDQ. MDMQ, Quito, Ecuador.

Municipality of the Metropolitan District of Quito. 2009. Description and scope of the MMP. In: Mobility Master Plan 2009-2025. Pp. 14-19.

Namita P, Mukesh R, Vijay KJ. 2012. *Camellia sinensis* (green tea): a review. Glob. Journal of Pharmacology 6:52-59.

Neher RT. 1968. The ethnobotany of Tagetes. Economic Botany 22:317-325.

Noguera Chacón, T. 2012. Preliminary assessment of the state of conservation of the Metropolitan Park and Itchimbía Park. Bachelor thesis, San Francisco de Quito University.

Noriega P, Medici A, Murillo A, Bedón J, Haro F, Galecio G. 2008. Study of cadmium and lead concentration in the air of the city of Quito, using bryophytes as biomonitors. La Granja: Life Sciences Journal 8:17-24.

Noriega P, Calero D, Larenas C, Maldonado ME, Vita Finzi P. 2014. Volatile components of the fruits of *Vasconcellea pubescens* A. DC. and *Passiflora tripartita* var. *mollissima* (Kunth) using the HS-SPME-GC/MS methodology. La Granja: Life Sciences Journal 19:5-11.

Noriega P, Taco A. 2018. The medicinal flora of the parks of the Metropolitan District of Quito.1st ed. Abya-Yala, Quito, Ecuador.

Noriega P, Vergara B, Carillo C, Mosquera T. 2019. Chemical Constituents and Antifungal Activity of Leaf Essential Oil from *Oreopanax ecuadorensis* Seem. (Pumamaki), Endemic Plant of Ecuador. Pharmacognosy Journal 11:1544-1548. doi:10.5530/pj.2019.11.236

Noriega P, Ballesteros J, De la Cruz A, Veloz T. 2020. Chemical composition and preliminary antimicrobial activity of the hydroxylated sesquiterpenes in the essential oil from *Piper barbatum* Kunth leaves. Plants 9(2): 211. doi: 10.3390/plants9020211

Nun J, Durán L. 2014. Cultural heritage, politics of representation and stigma: a view from the Historic Center of Quito.In: Nun J, Annecchario M, Camarotti R, Carvajal F, Durán L, Ferreño L, Giraldo IC, López P, Serrano FM, Montllor J, Olaza M, Barbosa LP, Rodríguez AV, Viviani T. (eds). Political cultures and cultural policies. Böll Cono Sur, Buenos Aires, Argentina. Pp. 145-162.

Oleszek W, Price KR, Fenwick GR. 1988. Triterpene saponins from the roots of *Medicago lupulina* L (black medick trefoil). Journal of the Science of Food and Agriculture 43:289-297. doi: 10.1002/jsfa.2740430402

Pareek A, Suthar M, Rathore GS, Bansal V. 2011. Feverfew (*Tanacetum parthenium* L.): A systematic review. Pharmacognosy Reviews 2011;5:103-110. doi: 10.4103/0973-7847.79105

Peana AT, L Moretti MD, Manconi V, Desole G, Pippia P. 1997. Anti-inflammatory activity of aqueous extracts and steroidal sapogenins of *Agave americana*. Planta Medica 63:199-202. doi: 10.1055/s-2006-957652

Peralta E, Moya R. 2003. Quito: World Cultural Heritage. TRAMA, Quito, Ecuador.

Perveen S, Sadler IH, Orfali R, Al-Taweel AM, Murray L, Fry SC. 2019. Montbresides A–D: antibacterial p-coumaroyl esters of a new sucrose-based tetrasaccharide from *Crocosmia × crocosmiiflora* (montbretia) flowers. Fitoterapy 139: 104377. doi: 10.1016/j.fitote.2019.104377

Pieroni A, Pachaly P. 2000. An ethnopharmacological study on common privet (*Ligustrum vulgare*) and phillyrea (*Phillyrea latifolia*). Fitoterapy 71: S89-S94. doi: 10.1016/S0367-326X(00)00182-9

Population and Demography. Results of the Population and Housing Census. 2010. Main Report. http://www.ecuadorencifras.gob.ec/censo-de-poblacion-y-vivienda/. (Accessed 6 March 2023).

Rajesh A, Doss A, Tresina PS, Mohan VR. 2019. Assessment of In vitro anti-inflammatory activity of ethanol extract of *Petiveria alliacea* L.(Phytolaccaceae). The International Journal of Bio-Pharma Research 8: 2569-2574.

Rather MA, Dar BA, Sofi SN, Bhat BA, Qurishi MA. 2016. *Foeniculum vulgare*: A comprehensive review of its traditional use, phytochemistry, pharmacology, and safety. Arabian Journal of Chemistry 9: S1574-S1583. doi: 10.1016/j.arabjc.2012.04.011G

Ríos M, Koziol MJ, Pedersen HB, Granda G. 2007. Useful plants of Ecuador: applications, challenges and perspectives.1st ed. Abya-Yala, Quito, Ecuador.

Sadeghi H, Mostafazadeh M, Sadeghi H, Naderian M, Barmak MJ, Talebianpoor MS, Mehraban F. 2013. In vivo anti-inflammatory properties of aerial parts of *Nasturtium officinale.* Pharmaceutical Biology 52: 169-174. doi: 10.3109/13880209.2013.821138

Salehi B, Zakaria ZA, Gyawali R, Ibrahim SA, Rajkovic J, Shinwari ZK, Khan T, Sharifi-Rad J, Ozleyen A, Turkdonmez, Valussi M, Tumer TB, Monzote Fidalgo L, Martorell M, Setzer W. 2019. Piper species: A comprehensive review on their phytochemistry, biological activities and applications. Molecules 24:1364. doi: 10.3390/molecules24071364

Sandoval JS, Quijano CE, Morales G, Pino JA. 2010. Composition of the essential oil from the Leaves and fruits of *Morella pubescens* (Humb. et Bonpl. ex Willd.) Wilbur grown in Colombia. Journal of Essential Oil Research 22: 133-134. doi: 10.1080/10412905.2010.9700283

Santillán AM, Villegas M. 2016. Images to rethink Latin American cities. Reflections on postcards about Quito (Monographic). Chasqui: Latin American Journal of Communication 130:107-126.

Sosa A, Fusco MR, Petenatti ME, Juárez A, Del Vitto LA, Petenatti E. 2007. Comparative pharmacognostic and pharmacological studies on three diuretic species of wide popular use in central-western Argentina. Boletín Latinoamericano y de Caribe de Plantas Medicinales y Aromaticas 6: 386-387.

Sumei L, Chunlin L, Fengyan L, Sangwoo L, Guo Q, Rong L, Yuheng L. 2006. Herbs for medicinal baths among the traditional Yao communities of China. Journal of Ethnopharmacology 108: 59-67.

Supratman U, Fujita T, Akiyama K, Hayashi H, Murakami A, Sakai H, Koshimizu K, Ohigashi H. 2001. Anti-tumor Promoting Activity of Bufadienolides from *Kalanchoe pinnata* and *K. daigremontiana× butiflora*. Bioscience, Biotechnology, and Biochemistry 65: 947-949. doi: 10.1271/bbb.65.947

Tene V, Malagon O, Finzi PV, Vidari G, Armijos C, Zaragoza T. 2007. An ethnobotanical survey of medicinal Gancel plants used in Loja and Zamora Chinchipe,Ecuador. Journal of Ethnopharmacology 111: 63-81. doi: 10.1016/j.jep.2006.10.032Gan

Travez J, Yánez P. 2016. Comparison of avifauna diversity and abundance between the UIDE Campus and the Guanguiltagua Metropolitan Park, Metropolitan District of Quito, and recommendations for its conservation. Bachelor thesis, UIDE.

Uprety Y, Asselin H, Boon, EK, Yadav S, Shrestha KK. 2010. Indigenous use and bio-efficacy of medicinal plants in the Rasuwa District, Central Nepal. Journal of Ethnobiology and Ethnomedicine 6: 1-10. doi:10.1186/1746-4269-6-3

Vinueza D, Lopez, E, Acosta K, Abdo S. 2017. Assessment of anti-inflammatory activity and cytotoxicity of freeze dried hydroalcoholic extract of *Bidens andicola* on isolated neutrophils. Asian Journal of Pharmaceutical and Clinical Research 10: (6). doi: 10.22159/ajpcr.2017.v10i6.17574

Von Schoen-Angerer T, Helmschmidt E, Madeleyn R, Kindt R, Möller C, Kienle GS,Vagedes J. 2016. A general pediatrics and integrative medicine approach to pervasive refusal syndrome: a case report. The Permanente Journal 20(4):15-238. doi: 10.7812/TPP/15-238.

Willcox ML, Graz B, Falquet J, Sidibé O, Forster M, Diallo D. 2007. *Argemone mexicana* decoction for the treatment of uncomplicated falciparum malaria. Transactions of the Royal Society of Tropical Medicine and Hygiene 101:1190-1198. doi: 10.1016/j.trstmh.2007.05.017

Zhou Y, Wang W, Tang L, Yan XG, Shi LY, Wang YQ, Feng BM. 2009. Lignan and flavonoid glycosides from *Urtica laetevirens* Maxim. Journal of Natural Medicines 63:100-101. doi: 10.1007/s11418-008-0274-8