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Assessment of the medicinal plant potential of the Delhi Ridge, Aravalli Range: traditional knowledge, biodiversity, and therapeutic applications

Evaluación del potencial de las plantas medicinales de la Cresta de Delhi, Cordillera de Aravalli: Conocimientos tradicionales, biodiversidad y aplicaciones terapéuticas

Ojha, Anju K.[1*]; Chandra Bala[2]

[1] Environmental Sciences Group, Department of Botany, Ramjas College, Delhi University, Delhi, India.

[2] School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, India.

* Corresponding author: <anjuojha@ramjas.du.ac.in>

Abstract

Plant resources have been crucial for human societies, providing sustenance and natural remedies. With globalization, research on medicinal plants has increased, as over half of clinically approved drugs have plant origins. This study explores the ethnobotanical knowledge and medicinal plant diversity in a specific region, emphasizing the demographic profiles of informants and the utilization of plant species for traditional medicine. A total of 92 participants, aged 30–85, were interviewed, revealing a predominance of male traditional healers and a significant correlation between age and medicinal plant knowledge. The research documented 70 medicinal plants belonging to 31 families, with Fabaceae being the most dominant with 16 species. Herbs (54%) were the prevalent growth form, followed by trees (26%). Leaves (32%) were the most commonly used plant parts, and decoction (34%) was the most popular preparation method. The results indicated a high use value (UV) for species such as *Azadirachta indica* (2.40) and a relative frequency of citation (RFC) value approaching unity for several key species, including *Acacia nilotica* and *Prosopis cineraria*. An informant

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consensus factor (ICF) analysis revealed that digestive diseases had the highest ICF value (0.94). The highest therapeutic redundancy (10.28 units) was observed in species like *Euphorbia hirta*, highlighting their versatile medicinal applications. This study underscores the importance of preserving traditional knowledge and plant diversity for future generations Ethnobotanical studies on indigenous plants are valuable for pharmaceutical development and sustainable healthcare.

Keywords: Medicinal plants; sustainable healthcare; traditional medicine, therapeutic redundancy.

Resumen

Los recursos vegetales han sido cruciales para las sociedades humanas, proporcionando sustento y remedios naturales. Con la globalización, la investigación sobre plantas medicinales ha aumentado, ya que más de la mitad de los fármacos clínicamente aprobados tienen origen vegetal. Este estudio explora el conocimiento etnomedicinal y la diversidad de plantas medicinales en una región específica, destacando los perfiles demográficos de los informantes y la utilización de especies vegetales para la medicina tradicional. Se entrevistó a un total de 92 participantes, de entre 30 y 85 años, revelando un predominio de curanderos tradicionales masculinos y una correlación significativa entre la edad y el conocimiento de plantas medicinales. La investigación documentó 70 plantas medicinales de 31 familias, siendo Fabaceae la más dominante con 16 especies. Las hierbas (54%) fueron la forma de crecimiento predominante, seguidas por los árboles (26%). Las hojas (32%) fueron la parte de la planta más utilizada, y la decocción (34%) fue la formulación más popular. Los resultados indicaron un alto valor de uso (UV) para especies como *Azadirachta indica* (2.40) y un valor de frecuencia relativa de citación (RFC) cercano a la unidad para varias especies clave, incluidas *Acacia nilotica* y *Prosopis cineraria*. Un análisis del factor de consenso de informantes (ICF) reveló que las enfermedades digestivas tenían el valor de ICF más alto (0.94). La mayor redundancia terapéutica (10.28 unidades) se observó en especies como *Euphorbia hirta*, lo que resalta sus aplicaciones medicinales versátiles. Este estudio subraya la importancia de preservar el conocimiento tradicional y la diversidad vegetal para las futuras generaciones. Los estudios etnobotánicos sobre plantas indígenas son valiosos para el desarrollo farmacéutico y la atención médica sostenible.

Palabras clave: Atención médica sostenible; medicina tradicional; plantas medicinales; redundancia terapéutica.

INTRODUCTION

Plant resources have held significant importance in human society. Beyond fulfilling basic needs like food and shelter, people have turned to plants for medicinal purposes to alleviate ailments (Mechaala *et al*., 2022). According to the World Health Organization's Global Centre for Traditional Medicine (2023), approximately 88% of the global population relies on traditional medicine as their primary healthcare option, especially in rural regions where modern healthcare systems are lacking.

Natural plant resources play a crucial role in traditional herbal therapy and contribute to the economic upliftment of local communities (Everest & Ozturk, 2005; Joshi & Joshi, 2006). Self-treatment using traditional herbal medicines is widespread across cultures globally (Heinrich, 2000). Over recent decades, there has been a surge in research focusing on medicinal plants for drug discovery (Ayyanar & Ignacimuthu, 2011). Natural products derived from plants have played a significant role in developing drugs, contributing to more than 50% of clinical drugs in the pharmaceutical industry (Ghimire *et al*., 2012). Medicinal plants have historically been pivotal in addressing human health needs, with approximately 50,000–70,000 species utilized in traditional and modern healthcare systems (Schippmann *et al*., 2006). Medicinal plants have been used for generations in rural areas and increasingly in urban settings of both developed and developing countries (Huai & Pei, 2002). There is a growing trend towards discovering new drugs using indigenous medicinal flora. The safety and efficacy of medicinal products derived from plants have been demonstrated, offering remedies for various health issues without adverse effects (Singh & Ahirwar, 2018).

India, one of the 12 mega-diverse countries, harbours about 8% of global biodiversity and a rich ethnobotanical heritage. Its indigenous knowledge, rooted in Ayurveda, Siddha, and Unani, has been recognized worldwide (Fabricant & Farnsworth, 2001). In remote areas, limited healthcare access leads traditional healers to rely on ancient practices for treating ailments (D'Rozario *et al*., 2004). Preserving this wealth of knowledge is imperative for the sustainable development of future generations. Traditional medicinal practices have declined in recent years due to various factors, including a lack of interest among the younger generation, mass deforestation, and rural depopulation, leading to the loss of valuable traditional knowledge (Hazarika *et al*., 2012).

The distribution of medicinal plants knowledge is unevenly distributed among various demographic group, influenced by sociocultural determinants such as age, gender, and educational background (Gomes *et al*., 2024; Tumoro & Maryo, 2016; Hu *et al*., 2020). Acknowledging this heterogeneity is vital for the accurate documentation and conservation of traditional knowledge systems. Furthermore, to enhance the accuracy and interpretive strength of ethnobotanical research, the use of quantitative tools- such as UV, RFC, and ICF are highly effective.

These indices allow researcher to pinpoint culturally important plant species and quantify the level of agreement among informants regarding their traditional applications (Tardio & Pardo-de-Santayana, 2008; Çakılcıoğlu & Türkoğlu, 2010; da Costa Ferreira *et al*., 2021).

Unexplored medicinal plants from remote regions, like the Aravalli Range in India, hold significant pharmaceutical potential, making their documentation crucial. Geographical factors such as climate, topography, and soil composition influence plant diversity, with the Aravalli Range being one of the oldest geological formations. The Delhi Ridge serves as a "green lung," protecting the city from hot desert winds. While several studies have examined the economic and medicinal value of plants in India, more research is needed, especially in the less-explored Delhi Ridge area.

This study investigates the influence of demographic variables on the acquisition, retention, and application of ethnobotanical knowledge. It systematically identifies predominant medicinal plant families, preferred growth forms, and preparation techniques while analyzing their ecological and cultural determinants. Furthermore, it quantifies correlations between Use Value (UV), Relative Frequency Citation (RFC), and Informant Consensus Factor (ICF) to assess the cultural significance and therapeutic redundancy of medicinal plants. Additionally, the research evaluates the impact of environmental availability on species selection, examines challenges in knowledge transmission across generations.

MATERIAL AND METHODS

Description of the study area

The study was conducted in Aravalli Mountain near Delhi region. The ridge is 2.5 billion years old. Due to its location in the State (53.8 km in length and 48 km in width), the physiographic features and vegetation vary. The climate of the study area is semi-arid and typically monsoon-influenced, with a high variation between summer and winter temperatures and precipitation. Annual values of extreme temperatures have ranged from 6°C to 47°C. The annual cycle has a dry period of about nine months (Indian Metrological Department, 2010). Monsoon season has the highest humidity of 60-76%; the air remains dry most of the year.

Ethnobotanical interview was conducted in the area of Asola, Rajpur Khurd, Sahoorpur, Satbari, Saidulajaib, Bhati, Nebsarai, Maidangarhi, Ayanagar, Dera Mandi, Jaunapur, Devli. These places are present close to study area. The study area's population belongs to various ethnic groups and religions, and the region's official language is Hindi. The participation of respondents (of both genders) and their residing permanently in the villages where we conducted the research.

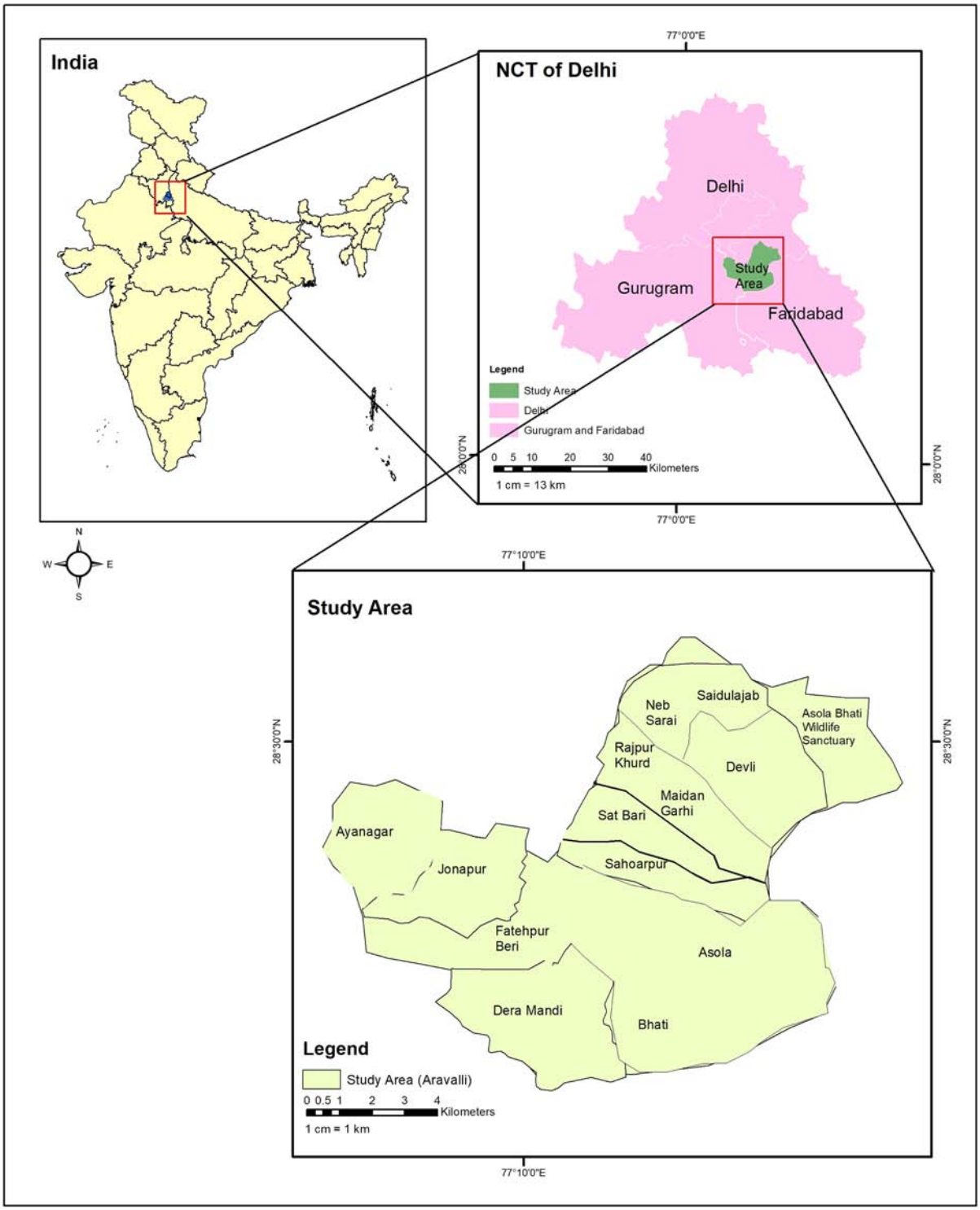

Fig. 1. Map of the study area (Delhi Ridge region, Aravalli - India).
Fig. 1. Mapa de la zona de studio (Delhi Ridge region, Aravalli - India).

Data collection and identification of medicinal plants

Ethnobotanical data on plants and their medicinal use were collected between August 2022 and December 2023 through semi-structured and structured face-to-face interviews conducted in the study area. Ninety-two informants, of whom 59 males and 33 females, were interviewed in this study. All the key informants (34), who were already well known traditional healers in the region, were male. In addition to general informants, key informants were purposefully selected and interviewed based on their extensive ethnobotanical knowledge. At the start of each interview, the research's purpose, methodology, and nature were explained to all participants, after which voluntary oral consent was obtained from all informants. Each informant had the chance to end the interview at any time. The purpose was to use traditional human experience to collect data on the therapeutic plants used by the indigenous people. Most of the informants were traditional healers skilled in traditional medicine. Ethnobotanical research was conducted based on standard international guidelines (International Society of Ethnobiology (ISE) Code of Ethics, 2006). We recorded the gender, age, level of education and occupation of all the respondents. Traditional knowledge on the use of medicinal plants in the study area was collected from farmers, housewives, medicinal plant pickers, and traditional healers. After interviews, data were deposited at the School of Environmental Sciences, Jawaharlal Nehru University. The correct taxonomy and nomenclature of the vascular plants were also checked by referring to World Flora Online (worldfloraonline.org). The herbarium of plant twigs bearing voucher numbers was deposited in the JNU New Delhi, India, for future reference.

Data Analysis

The data were collected, curated, and statistically analysed. The voucher number, scientific and local names, habit, part used, mode of preparation, and medicinal uses were included in each column as attributes of that reference. SPSS software was used for statistical analyses. All the diagram prepared by using the circle package in R studio.

Use value (UV)

Use value (UV) was used to determine the relative importance of the medicinal plants (Phillips & Gentry, 1993):

$$UV = Ui / N$$

where *Ui* is the number of use reports, citations, or mentions by each informant for a particular species, and *N* is the total number of informants who participated in the study. Low numbers signify fewer mentions or citations, whereas high values show a significant volume of use reports or citations from the informants.

Relative frequency citation (RFC)

The relative frequency of citation (RFC) was computed to know the importance of the species. The relative frequency citation (RFC) is used to determine the relative frequency of reference or mention from the study participants who served as informants and calculated using the formula:

$$RFC = FC / N$$

where *FC* is the number of informants cited or mentioned plant, and *N* is the total number of informants (Tardio & Pardo de Santayana, 2008). The values closest to 1 show that nearly all informants mentioned a medicinal plant used to treat a particular illness. Low scores show that the usage or purpose of a medicinal plant species is mentioned by few.

Informant consensus factor (ICF)

The informant consensus factor (ICF) was used to assess the homogeneity or degree of agreement of the informants' knowledge about medicinal plants and calculated as follows:

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

where *Nur* represents the number of use reports or citations for each illness category, and *Nt* represents the number of medicinal plant species utilized in that specific category informants (Tardio & Pardo de Santayana, 2008).

Fidelity level

The percentage of the most popular and valuable medicinal plant for a specific condition or use category was calculated using fidelity level (FL) using the formula:

$$FL\ (\%) = Np / N \times 100$$

where *NP* is the proportion of informants who cited or discussed using a medicinal plant to treat a specific disease category, and *N* is the total num-

ber of informants who cited the plant for any other use or purpose (Friedman *et al*., 1986). A medicinal plant with a high value will likely have many citations and be the most popular species for treating a specific condition.

Measuring therapeutic redundancy

Data provided by participants was utilized to ascertain the study area's local therapeutic categories and disease classifications. Notably, the estimated species therapeutic redundancy was calculated based on the total therapeutic redundancy of each species mentioned in the participants' pharmacopeia, following the utilitarian redundancy model proposed by Albuquerque and Oliveira (2007). We calculated species therapeutic redundancy as

$$R = (\Sigma Si / n) \times W$$

Here, ΣSi is the sum of the total number of plant species that can be used to treat a given illness or fulfil a given therapeutic function across therapeutic functions cited for a single species, n is the total number of species cited by participants and W is the total number of therapeutic functions fulfilled by a given species.

RESULTS

Demographic Profile

Many field tours were arranged in different seasons to collect and document the best possible ethnobotanical data. The participants were of both genders and resided permanently in the villages where we conducted the research. We interviewed 59 men and 33 women (n = 92), aged 30–85. Regarding the demographic characteristics of the informants, males constituted the majority, whilst females were in the minority. All the key informants, already renowned traditional healers in the area, were males, confirming that males dominate in practice. Most interviewees were between 51-70 years (46.73%) (Table 1). The informants' ability to mention more medicinal plant species also varied according to their age. Informants above 40 years could mention and identify more medicinal plants during this study than those 40 years and below. A large proportion of respondents had completed secondary education (40.21%). Oral transmission from one generation to another was the main way informants acquired their knowledge on curing diseases with medicinal plants.

Table 1. Demographic features of local informants in the study area (n = 92).

Tabla 1. Características demográficas de los informantes locales de la zona de estudio (n = 92).

Demographic features (%)	Abundance	Relative abundance (%)
Gender		
Male	59	64.13
Female	33	35.86
Age group		
30-50	33	35.86
51-70	43	46.73
71-85	16	17.39
Education		
Literate	14	15.21
Primary level	21	22.82
Secondary level	37	40.21
Graduation	20	21.73
Healing experience		
Key informants	34	36.95
General informants	58	63.04

Medicinal Plant Diversity

About 70 plants were documented during fieldwork for medicinal purposes (Fig. 2). The collected 70 plant species belonged to 31 taxonomic plant families. The Fabaceae family, with 16 medicinal species, was the most dominant, followed by Asteraceae (10%), and Acanthaceae (7.14%) with seven and five species, respectively. The Convovulaceae family represented four species, Lamiaceae. Malvaceae and Amaranthaceae and Poaceae representing three species each.

Growth forms

Herbs, shrubs, and trees were the preferred growth forms of the therapeutic plants in the study area. With 38 species (54%), herbs had the highest percentage of all growth forms, followed by 18 species (26 %) of trees and 14 species (20%) of shrubs (Fig. 3).

Mode of Utilization

Medicinal plants found in the study areas were most commonly used in the form of decoction (34%), powder (22%), paste (17%), extract (17%), raw (7%) and oil (3%) (Fig 4). Most plants were used internally, while some were used externally as paste or powder. For preparing different herbal products, the respondents in the study areas preferred fresh plant materials compared to dried ones.

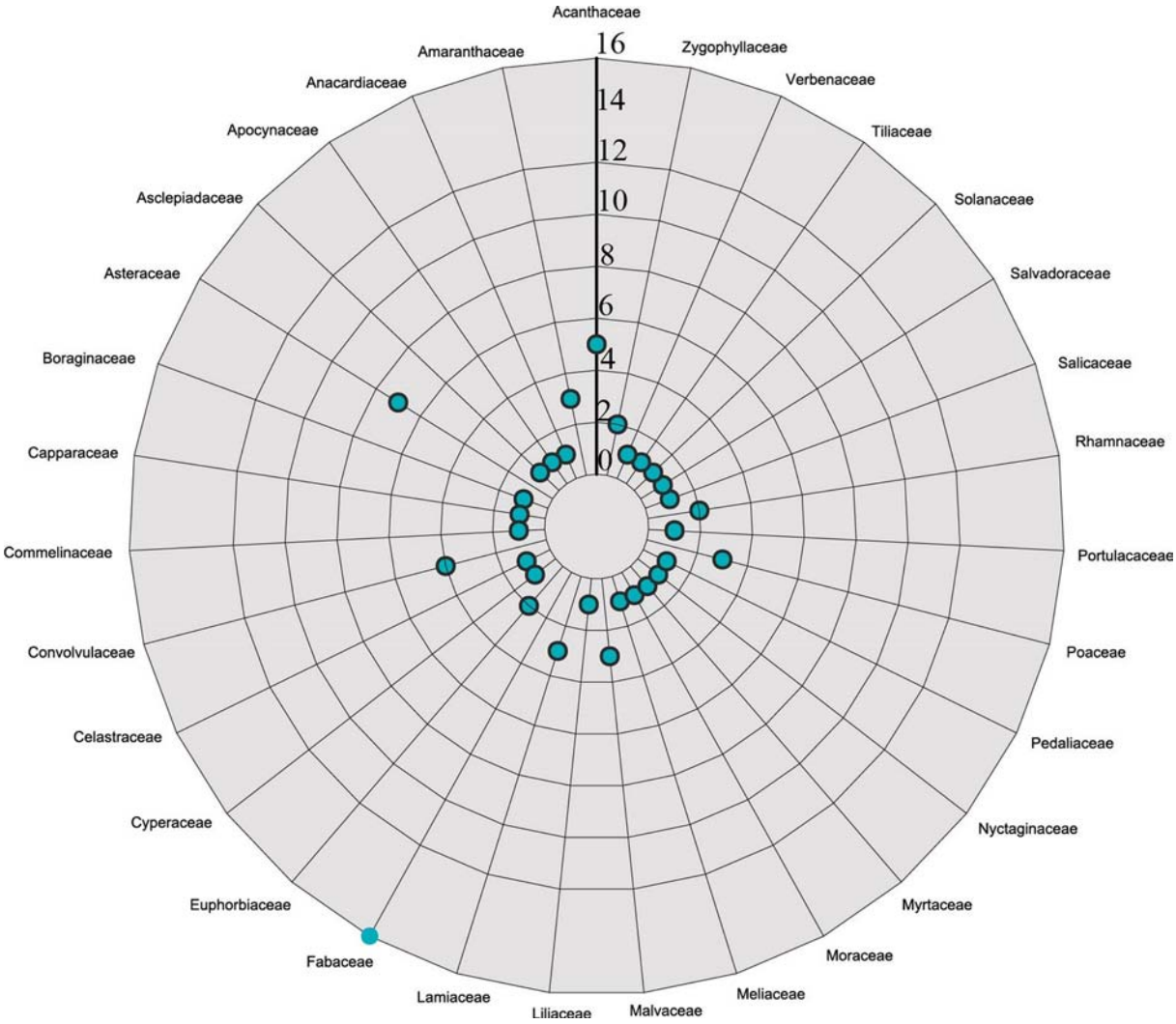

Fig. 2. Contribution of families used in traditional medicine in the Delhi Ridge region.

Fig. 2. Contribución de las familias utilizadas en la medicina tradicional en la zona de Delhi Ridge.

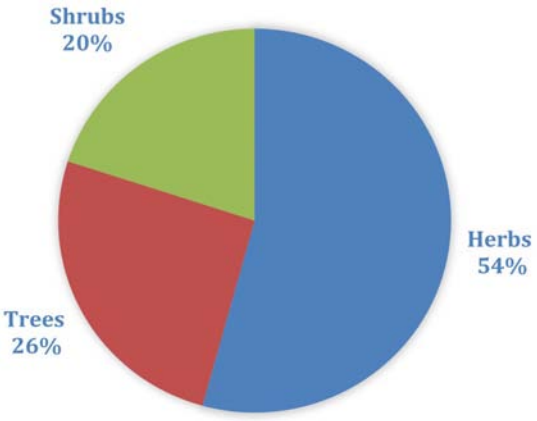

Fig. 3. Growth forms of medicinal plants in the Delhi Ridge region.

Fig. 3. Formas de crecimiento de las plantas medicinales en la región de Delhi Ridge.

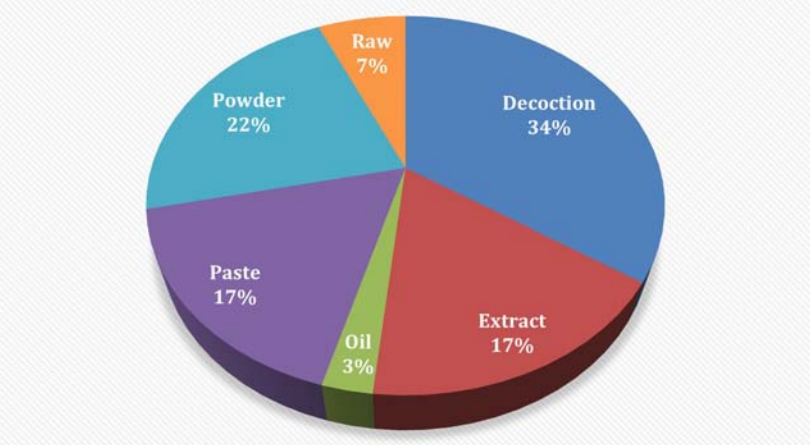

Fig. 4. Preparation methods of traditional medicine.
Fig. 4. Métodos de preparación de la medicina tradicional.

Medicinal Plant Parts Used for the Treatment of Diseases

The local inhabitants most commonly used plant parts are leaves, roots, whole plant and fruits. Leaves were reported 55 times in the documented 70 plants, followed by the use of the root 39 times and the whole plant 21 times (Fig. 5A and 5B). Moreover, other plant parts used to treat different diseases included fruits (18times), seed (16 times), bark (14 times), stem (7 times), flower (8 times), latex (2 times) heart wood, wood pulp, bud and gum each (1 time).

Use Value

The present study's use value (UV) ranged from 0.08 to 2.40 (Table 2; annexure 1). *A. indica* (2.40) had the highest UV, followed by *S. indicum* (1.82) and *A. nilotica* (1.65). The lowest UV value recorded was for *Z. diphylla* Pers (0.08).

Relative Frequency Citation

In the present study, the relative frequency citation (RFC) value ranged from 0.04 to 0.99 (Table 2; annexure 1). As is evident from the data, the highest value of RFC was recorded in the case of the native plants of the area. The highest value was found in the case of *A. nilotica* (0.99) and *A. indica* (0.99), followed by *P. cineraria* (0.98), *S. indicum* (0.96), and the lowest RFC in the case of *Z. diphylla* (0.04). Homogeneity in the traditional knowledge was evaluated using quantitative indices, *i.e.*, Relative Frequency of Citation (RFC).

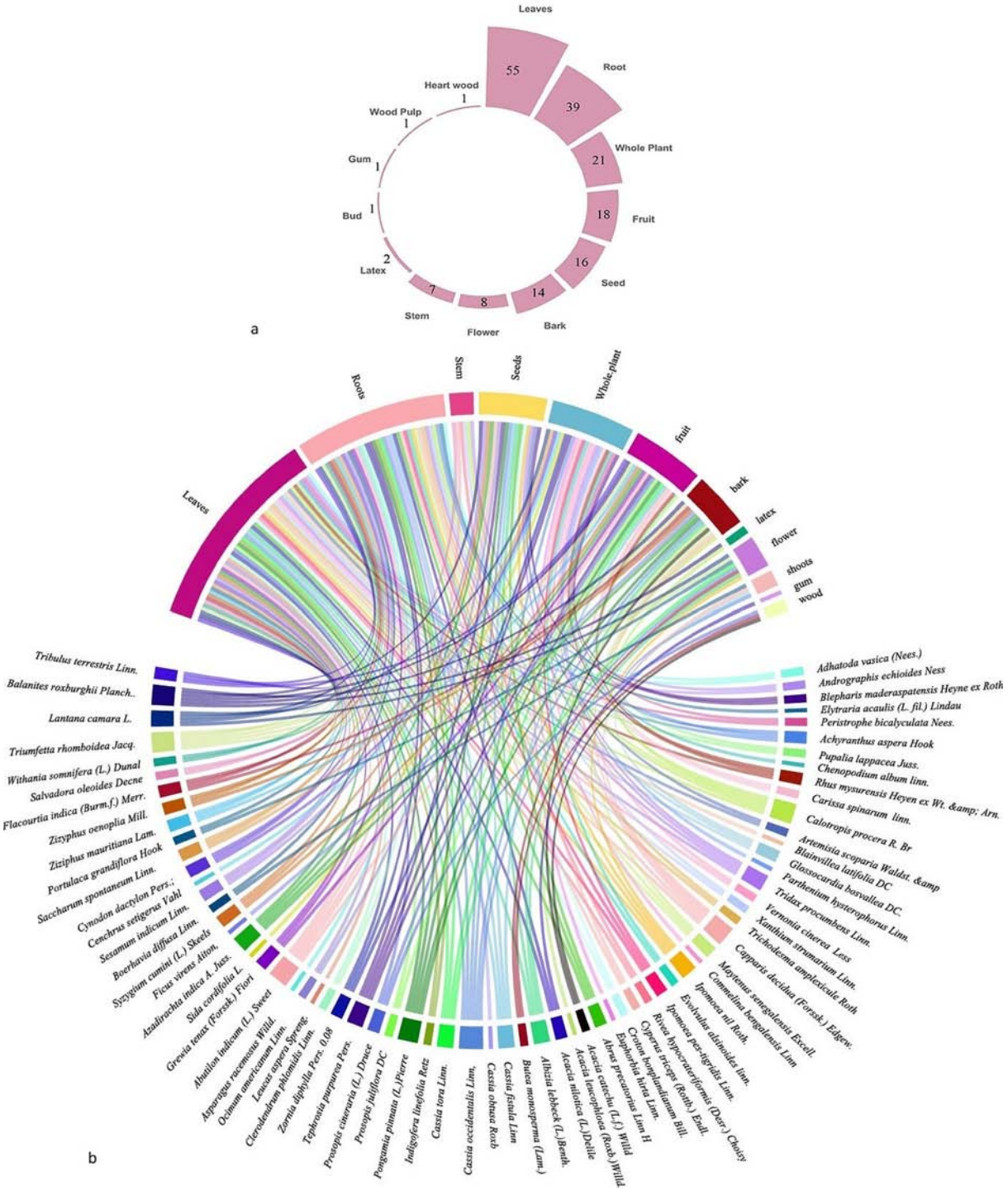

Fig. 5. Plant parts used in traditional medicine. A) Accumulated frequency of use by organ/plant extract or part. B) Chord diagram showing the different parts of the medicinal plant species.

Fig. 5. Partes de plantas utilizadas en la medicina tradicional. A) Frecuencia acumulada de uso por órgano, extracto o parte de la planta. B) Diagrama de acordes que muestra las diferentes partes de las especies de plantas medicinales.

Table 2. Comparison between different quantitative indices.
Tabla 2. Comparación entre distintos índices cuantitativos.

Rank	Plants	UV	Plants	RFC	Plants	NU
1	*Azadirachta indica* A. Juss	2.40	*Azadirachta indica* A. Juss	0.99	*Calotropis procera* R. Br	11
2	*Sesamum indicum* Linn.	1.82	*Acacia nilotica* Wild	0.99	*Sesamum indicum* Linn	10
3	*Acacia nilotica* Wild	1.65	*Prosopis cineraria*	0.98	*Pongammia pinnata*	10
4	*Acacia catechu* (L.f.) Willd	1.56	*Syzygium cumini* (L.) Skeels	0.98	*Euphorbia hirta* Linn	10
5	*Syzygium cumini* (L.) Skeels	1.35	*Sesamum indicum* Linn.	0.96	*Prosopis cineraria*	9
6	*Prosopis cineraria*	1.34	*Acacia catechu* (L.f.) Willd	0.96	*Azadirachta indica* A. Juss	8
7	*Pongammia pinnata*	1.30	*Boerhavia diffusa* Linn	0.94	*Syzygium cumini* (L.) Skeels	8
8	*Asparagus racemosus* Willd	1.21	*Chenopodium album* Linn	0.90	*Boerhavia diffusa* Linn	8
9	*Evolvulus alsinoides* Linn.	1.21	*Achyranthus aspera* Hook	0.83	*Acacia nilotica* Wild	8
10	*Chenopodium album* Linn	1.16	*Evolvulus alsinoides* Linn.	0.75	*Chenopodium album* Linn	8

Fidelity Level

The value of the fidelity level (FL) (annexure 1) ranged from 21.30 to 97.8% (annexure 1). In the present study, the highest FL was represented by *A. catechu* (L.f.) Willd (100%) for mouth sore, *S. cumini* (L.) for diabetes, *A. indica* (97.8%) for skin diseases followed by *C. album* linn. (89.15%) for blood purification, and *A. nilotica* (89.01%) as an immunity booster. At the same time, the lowest FL was recorded in the case of *M. senegalensis* (23.07%) to treat rheumatism.

Informant consensus factor (ICF)

In this study, the informant consensus factor (ICF) was examined for 15 ailment categories *i.e.*, infectious diseases, neoplasms, blood diseases, metabolic diseases, nervous system disorder, visual and ear diseases, cardiovascular diseases, respiratory diseases, digestive diseases, skin diseases, genitourinary diseases, connective diseases, general symptoms, injury, and poisonous bites. The ICF value ranged from 0.94 to 0.74 (Fig. 6). The highest value of ICF was reported for digestive diseases (0.94), followed by diabetes (0.93), and 0.92 for general symptoms like body pain, inflammation, nose bleeding, dandruff, heat stroke, and fever.

Comparison between quantitative indices

Table 2 shows the ranking of medicinal plants with the most disease or use categories, UV, and RFC values. Medicinal plants with the highest UV and RFC values are the most highly regarded and culturally significant in the study area. The number of use reports, the frequency of citations from the informants, and various applications or purposes in ailment categories are used to evaluate them. In all three indices, the top 10 medicinal plants were nearly identical, with the possible exceptions of *E. hirta* Linn., *B.*

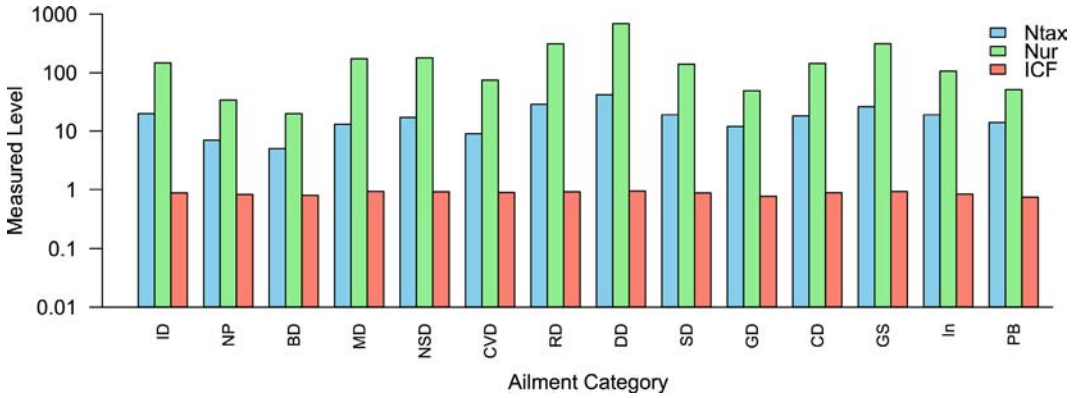

Fig. 6. Informant consensus factor (ICF) of different disease categories with use reports and total number of species used. **References:** BD, Blood diseases; CD, Connective diseases; CVD, Cardiovascular diseases; DD, Digestive diseases; GD, Genitourinary diseases; GS, General symptoms; ICF, Informant consensus factor; ID, Infectious diseases; In, Injury; MD, Metabolic diseases; NP, Neoplasms; NSD, Nervous system disorder; Ntax, total number of species used for group of ailments; Nur, total number of used reports for group of ailments, PB, Poisonous bites; RD, Respiratory diseases; SD, Skin diseases.

Fig. 6. Factor de consenso de informantes (ICF) de diferentes categorías de enfermedades con informes de uso y número total de especies utilizadas. **Referencias:** BD, Enfermedades de la sangre; CD, Enfermedades del tejido conectivo; CVD, Enfermedades cardiovasculares; DD, Enfermedades digestivas; GD, Enfermedades genitourinarias; GS, Síntomas generales; ICF, Factor de consenso de informantes; ID, Enfermedades infecciosas; In, Lesiones; MD, Enfermedades metabólicas; NP, Neoplasias; NSD, Trastornos del sistema nervioso; Ntax, número total de especies utilizadas para un grupo de dolencias; Nur, número total de informes de uso para un grupo de dolencias; PB, Mordeduras venenosas; RD, Enfermedades respiratorias; SD, Enfermedades de la piel.

diffusa Linn.; being listed in the NU (number of use). These two plants have a high number of multiple uses; however, their UV, RFC are not high compared to the other species. Based on both RFC and UV indices, *A. indica* A. Juss is ranked one. This could be because the species is the most well-known plant in the majority of research sites and is frequently referenced by informants. Moreover, we observed a significant positive correlation between RFC and UV the two metrics as indicated by the Pearson correlation coefficient of 0.69 ($p < 0.003$) (Fig. 7).

Based on the informants' citations, high UV, and various applications across many disease categories, *A. indica* A. Juss, *A. nilotica* Wild, *A. catechu* (L.f.) Willd, *P. cineraria*. *S. indicum* Linn. and *S. cumini* (L.) Skeels are the most culturally favoured, valued, advised, and significant medicinal plants among the indigenous people.

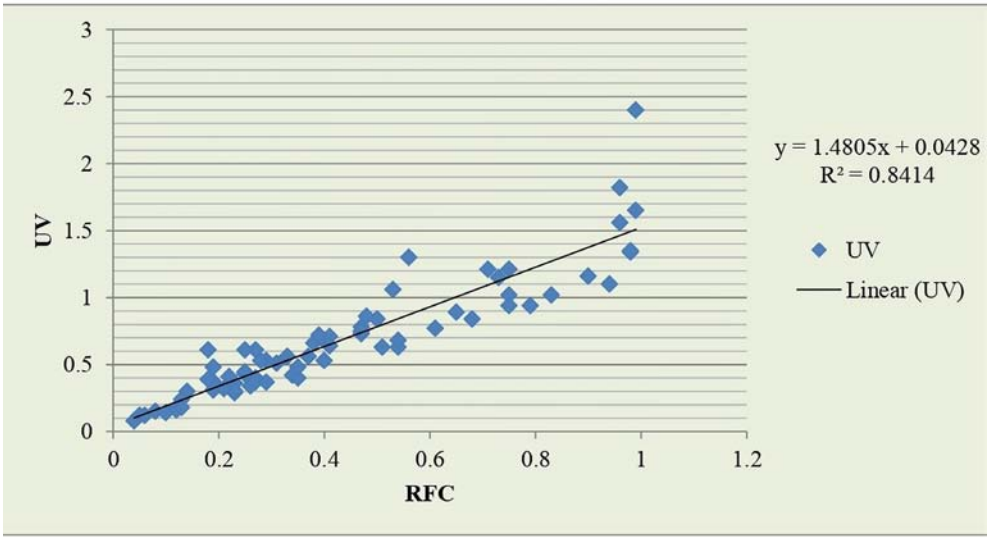

Fig. 7. Pearson correlation between Relative frequency citation (RFC) and use value (UV).

Fig. 7. Correlación de Pearson entre la frecuencia relativa de citación (RFC) y el valor de uso (UV).

Therapeutic redundancy of medicinal plant species

Of these 70 medicinal plant species were cited as preferred for treating a given medicinal therapeutic function. In all, 62 local therapeutic categories were cited by participants. Most plant species were often used to treat the following illnesses: fever (n = 22 species), asthma (n=15 species), rheumatism (n = 15 species), cold and cough (n = 14 species) and diabetes (n = 13 species) (Fig. 8a). In contrast, fewer plant species were used to treat stone (n = 3 species), Leukoderma (n = 2 species), Earache (n = 1 species), and to treat Vertigo (n = 1 species) (Fig. 8a). The species with the highest level of therapeutic redundancy were *E. hirta* Linn. with 10.28 units, *A. nilotica* (L.) Delile with 9.6 units and *P. cineraria* (L.) Druce with 9.12 units (Fig. 8b). This indicates these species are among the most versatile medicinal plants and share several similar therapeutic functions with other species. In contrast, species with the lowest level of therapeutic redundancy were *F. virens* Aiton with 0.22 units, *I. linefolia* Retz. with 0.23 units and *A. leucophloea* (Roxb.) Willd. with 0.29 units (Fig. 8b) suggesting these species fulfil unique or non-redundant therapeutic functions within ethnomedicine of studied area.

DISCUSSION

Diversity of medicinal plants and their ethnobotanical uses for as long as mankind has existed, plants have been used for a variety of purposes, especially for nutrition and treatment. Nevertheless, it has been discussed in various investigations that the ethnomedicinal plants have been used

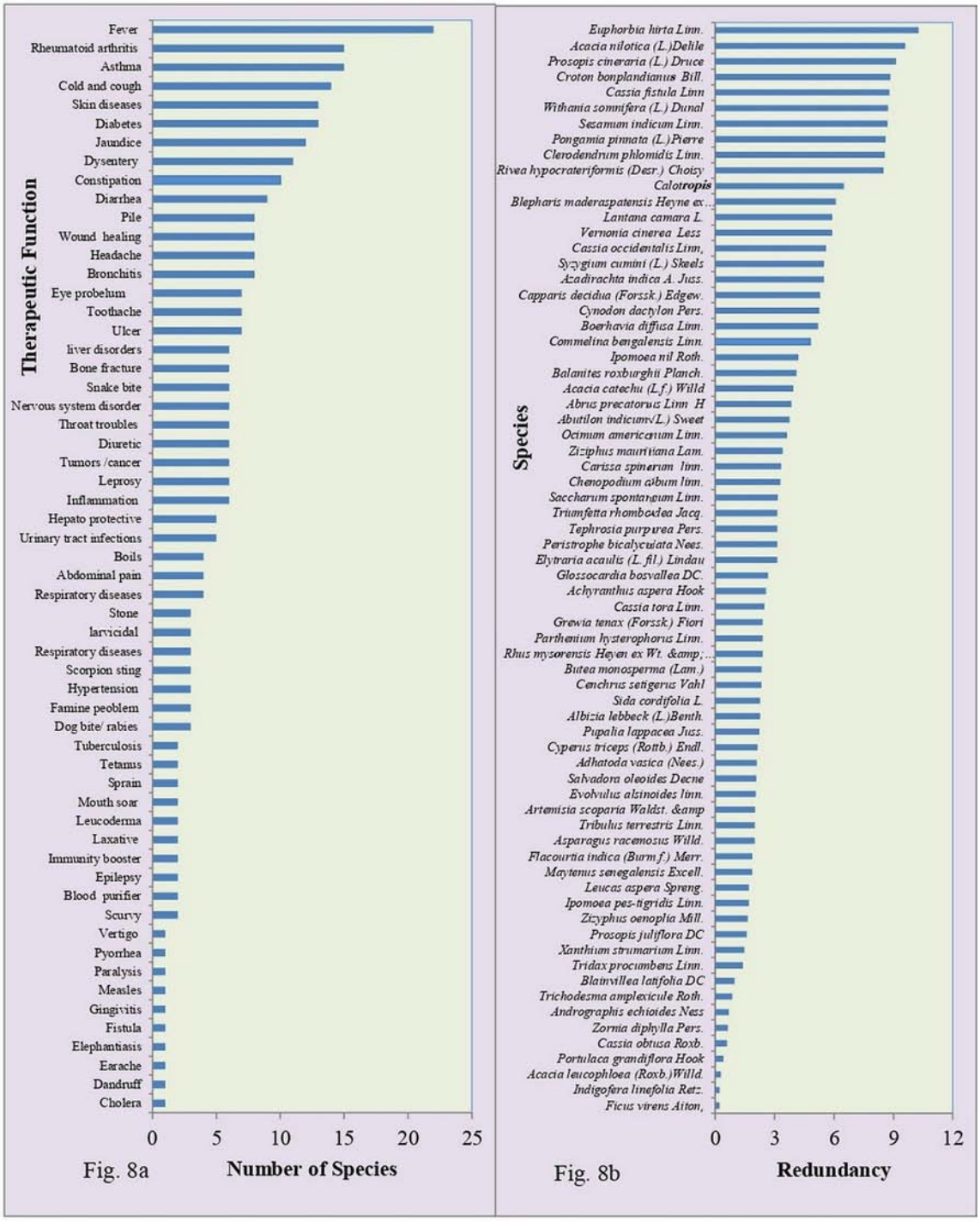

Fig. 8. Species therapeutic redundancy in the study area. (a) Total number of medicinal plant species mentioned to fulfil a given therapeutic function. (b) Redundancy of medicinal plant species mentioned by informants.

Fig. 8. Redundancia terapéutica de las especies en la zona de estudio. (a) Número total de especies de plantas medicinales mencionadas para cumplir una función terapéutica determinada. (b) Redundancia de especies de plantas medicinales mencionadas por los informantes.

by the population to treat many diseases such as digestion, bone fracture, appetizer, hemorrhoids, hypertension, asthma, bronchitis, sore throat, joint pain, nausea, vomiting, obesity, anti-aging, cooling effect etc. (Rahim *et al*., 2023). Documentation of ethnic medical knowledge is crucial to prevent its loss, considering its vital role in rural healthcare and the bicultural heritage (Nguanchoo *et al*., 2023).

Ethnomedicinal healers traditionally transmit knowledge of herbs and their healing properties verbally through generations within families, ensuring the preservation and evolution of traditional herbal remedies over time (Nadembega *et al*., 2011). With regards to the demographic characteristics of the informants, males constituted the majority whilst females were in the minority. All the key informants —who already renowned traditional healers in the area— were males which confirms that males actually dominate in the practice (Dery *et al*., 2023). This gender-based contrast in medicinal plant knowledge on national and continental levels may be linked to differences in socio-cultural backgrounds. It is observed that informants aged 40 year and above exhibited a greater ability to identify and mention medicinal plant species compared to those under 40 years old (Dery *et al*., 2023; Singh *et al*.,2025). This divergence in knowledge could stem from the reliance on oral transmission for passing down medicinal plant practices across generations, rather than through documentation (Batool *et al*., 2023). Similar findings regarding variations in medicinal plant knowledge among different age and gender groups have been documented in various studies globally (Tumoro & Maryo, 2016; Hu *et al*., 2020). However, this valuable knowledge is at risk due to waning interest among younger generations and inadequate documentation efforts (Cordero *et al*., 2023).

The Fabaceae family, comprising 16 medicinal species, exhibited significant dominance in our research area. This dominance aligns with findings from other regions globally, where Fabaceae accounted for 22.23% in one study in Ghana (Dery *et al*., 2023) and 23.63% in Sudan (Muhakr *et al*., 2024). Remarkably, these regions share a semi-arid nature akin to our research area, suggesting a correlation between environmental conditions and the prevalence of Fabaceae species. Additionally, the Asteraceae family also emerged as a dominant repository of ethnomedicinal plants, as highlighted by Usman *et al*. (2021). This underscores the significance of certain plant families in traditional medicine, potentially due to their stronger adaptation to semi-arid environments and their inherent medicinal properties (Muhakr *et al*., 2024). The wider use of medicinal plant species belonging to the above families in herbal medicines has been reported in other studies from different parts of India (Batool *et al*., 2023).

Herbs emerge as the predominant plant species used in traditional medicine owing to their easy accessibility, especially in natural forest habitats. Similarly, most ethnobotanical research in India (Ralte *et al*., 2024) and other countries (Muhakr *et al*., 2024; Agize *et al*., 2022).

Their common habitation and easy collection around natural forests and the presence of herbs throughout the study area may have been the main reasons for this.

The prevalent utilization of leaves in this recent investigation can be ascribed to their role as the primary photosynthetic components of plants, which are readily accessible and abundant, especially in tropical regions like India. In majority of traditional medicine, leaf is the most frequently used medicinal plant components to treat any health issues, and the root is the next part for treating ailments similarly to other areas (Agize *et al*., 2022; Dery *et al*., 2023). Moreover, leaves are preferred over other plant parts due to their minimal impact on plant sustainability and ease of regeneration. However, flowers and latex are less commonly used due to their periodic availability and harvesting challenges (Kadir *et al*., 2013; Dery *et al*., 2023) Leaves are the most utilized plant part due to their abundance, ease of collection, and the presence of essential bioactive compounds crucial for medicinal purposes (Tugume & Nyakoojo, 2019). Opting for leaves sustains the plant's health, contrasting with the potentially disruptive practice of harvesting roots (Ralte *et al*., 2024; Ahad *et al*., 2023).

Indigenous communities have been found to use medicinal plants to treat various diseases in different ways. Decoction (34%) is commonly employed, utilizing water or local alcohol to extract plant constituents effectively, followed by powder (22%), extract and paste (17% each). According to Agize *et al*. (2022) in Ethiopia informants reported that most medicinal plants are used in decoction to dissolve the chemicals of the material and that they extract its constituents using water and local alcohol (Harak'iya). Decoction is the most preferred mode of preparation used by informants because they believed that heat better release bioactive components of the plants in water and also to avoid microbial attack. The use of honey to shun the uncomfortable taste of the decoction and extracts taken orally (Agize *et al*., 2022; Zaigham *et al*., 2019). Additives like milk or honey or oil are frequently used to improve the acceptability of certain oral remedies in line with previous reports (Muhakr *et al*., 2024; Malik *et al*., 2019). Traditional medicines can be delivered orally, topically, massage and inhalation. Oral uptake (52 species, 74.37%) was the main route of administration in the study area. It was found that a large number of respondents take these medicinal plants orally, which is consistent with previous research in other parts of the world where oral intake was reported as the main route of administration (Muhakr *et al*., 2024).

The Use Value (UV) metric highlights the importance of medicinal plants in specific areas (Hassan *et al*., 2019). Use value is an essential tool for identifying highly valuable medicinal plants for further detailed pharmacological research and their used reliability (Çakılcıoğlu & Türkoğlu, 2010). It has been proposed that UV value, rather than citation count, is a more accurate indicator of use diversity (Da Silva *et al*., 2006).

Furthermore, local populations often rely on medicinal plants with high UVs for treating various ailments, emphasizing the significance of preserving traditional knowledge (Kayani *et al*., 2014). Higher UV value indicates the more rate of transfer of knowledges among the practitioner and user of traditional medicine (Parthiban *et al*., 2016). The species with the highest utilization values (UVs) demonstrated the highest level of awareness, on the other hand, the plants with low used value exhibited a proportionately lower level of awareness and their less use might increase the risk of disappearing of their curative Knowledge (Chaudhary *et al*., 2006).

Homogeneity in the traditional knowledge was evaluated using quantitative indices *i.e*. Relative Frequency of Citation (RFC). Higher RFC values indicate the retention and smooth transmission of traditional knowledge among local people (Faruque *et al*., 2018). The data unequivocally shows that the highest RFC was observed for the indigenous flora of the region. This paramount value was identified within the context of native plant species *A. nilotica* (0.99) and *A. indica* A. Juss (0.99), and a considerable positive correlation was observed between the relative importance of plant use and the local relevance of each medicinal plant, as indicated by the Pearson correlation coefficient of 0.69 ($p < 0.003$) between RFC and UV. This finding was in comparison with earlier research that also found a strong positive association between RFC and UV (Ahmad *et al*., 2017; Laldingliani *et al*., 2022). Among the known medicinal plants, *A. indica* exhibited the highest UV and RFC values, indicating that it is the most valued and favoured medicinal plant for treating various diseases across several ailment categories. Azadirachtin, along with compounds like nimbolidenimbolinin, nimbin, nimbidin, nimbidol, sodium nimbinate, gedunin, salannin, and quercetin, are phytochemicals renowned for their diverse biological potentials. These include anticancer, antibacterial, antifungal, anti-hyperglycemic, anti-inflammatory properties, and capabilities in wound healing (Alzohairy, 2016).

The study found that plants with higher FL values tend to have greater efficacy in their designated medicinal uses (Ralte *et al*., 2021). The species that are most commonly used in certain areas for the treatment of specific ailments have a maximum FL (Farooq *et al*., 2019; Farnsworth, 1988). For instance, highest FL (100%) was represented by *A. catechu* (L.f.) Willd for mouth sore, *S. cumini* (L.) for diabetes, *A. indica* demonstrated FL (97.8%) for skin diseases, followed by *C. album* Linn. (89.15%) for blood purification. These findings suggest that these plants possess significant healing potential. Researchers exploring phytoextraction to isolate bioactive compounds could benefit from selecting plants with high FL values. Conversely, *M. senegalensis* (Lam.) Exell exhibited the lowest FL (23.07%) to treat rheumatism, indicating comparatively weaker medicinal efficacy in this context.

In the present study, the informant consensus factor (ICF) was examined for 15 ailment categories. Digestive system disorders had the highest ICF, indicating strong agreement among informants on the use of plant species for treating diseases in this category (Ghorbani *et al*., 2011). These findings are consistent with previous ethnobotanical studies, where digestive system disorders also recorded the highest ICF values among informants (Faruque *et al*., 2018; Khastini *et al*., 2021; Sutjaritjai *et al*., 2022). However, Juárez-Vázquez *et al*. (2013) and Laldingliani *et al*. (2022) noted digestive system disorders as their second highest observed ICF value. An ICF of ≥ 0.71 indicates a high degree of consensus among informants (Andrade-Cetto & Heinrich, 2011). The ICF depends on the accessibility of the taxa for treating various diseases in the study area (Rajakumar & Shivanna, 2009). A high ICF is a valuable parameter for selecting species to preserve in environments where medicinal plant species are steadily disappearing (Heinrich *et al*., 1998).

Therapeutic redundancy is common in traditional medicine systems worldwide, where different plants with similar properties are used in herbal remedies depending on availability, cultural preferences, and regional traditions. This is often seen in traditional herbal medicine practices where multiple plants are combined in formulations to improve efficacy and reduce side effects. This helps to conserve biodiversity and ensures the sustainability of medicinal plant resources. Medicinal plants with similar therapeutic benefits may face higher utilization pressure, irrespective of their redundancy in treatment effectiveness. This is because most people often prefer them over other available species for treatment purposes (Coe & Gaoue, 2021). Consequently, the indigenous medicinal customs of a particular culture are likely to remain largely unaffected by the reduction in redundant species, while non-redundant species may witness contrasting effects. (Gaoue *et al*. 2017; Nascimento *et al*., 2015). Our study has shown that species therapeutic redundancy can predict species use pressure. Our findings indicate therapeutically redundant species experienced greater use pressure than less therapeutically redundant species when preference is not considered (Coe & Gaoue, 2021). Therefore, it was anticipated that certain medicinal plants might face increased utilization pressure, regardless of their therapeutic redundancy, if they are favoured for multiple therapeutic purposes. We also acknowledge various individual sociocultural and socioeconomic factors, such as age, gender, formal education, and literacy levels, are linked to an individual's level of knowledge about medicinal plants. (Albuquerque *et al*., 2011; Gaoue *et al*., 2017; McCarter & Gavin, 2015). Surprisingly, this suggests an alternative understanding of utilitarian redundancy and use preference of ethnobotanical species use patterns that both supports and contrasts with the central prediction of the utilitarian redundancy model (Albuquerque & Oliveira, 2007).

From a scientific standpoint, therapeutic redundancy in medicinal plants can offer opportunities for drug discovery and development. Studying the active compounds in different plants with similar therapeutic effects can lead to the identification of new drugs or the improvement of existing ones.

CONCLUSION

The prevalence of certain plant families emphasizes their ecological resilience and medicinal significance, indicating promising areas for further exploration into their therapeutic properties and adaptation mechanisms. Recognizing the multiple healing potentials of plants is essential for sustainable herbal medicine practices and conservation endeavours. It underscores the crucial role of biodiversity preservation and the safeguarding of traditional medicinal knowledge systems. Studying the utilization of medicinal plants can facilitate future breakthroughs in drug development. Research in this area documents traditional practices and assesses their potential in pharmaceutical innovation, stressing the importance of preserving cultural wisdom for sustainable healthcare. This redundancy proves particularly valuable in regions with limited access to modern healthcare and pharmaceuticals. Communities deeply rooted in traditional herbal medicine often employ various plants to address common health issues, drawing from nature's diverse pharmacopeia. Overall, the presence of therapeutic redundancy underscores the intricate richness of nature's healing resources. By acknowledging and harnessing this diversity, we can unlock novel pathways for healthcare and drug discovery while respecting the wisdom passed down through generations. Based on their high use value, strong informant consensus, and low therapeutic redundancy, species like *A. nilotica*, *P. cineraria*, and *E. hirta* emerge as promising plants for advanced pharmacobotanical research. These plants possess substantial medicinal uses but have received limited attention in contemporary scientific studies, highlighting their potential for novel therapeutic discoveries.

Supplementary Figure. Some important medicinal plants with the highest indices: A) *Azadirachta indica* A. Juss. B) *Acacia nilotica* Wild. C) *Prosopis cineraria* (L.) Druce. D) *Pongammia pinnata* (L.) Pierre. E) *Boerhavia diffusa* Linn. F) *Euphorbia hirta* Linn. G) *Calotropis procera* R. Br. H) *Sesamum indicum* Linn. I) *Syzygium cumini* (L.) Skeels.

Figura suplementaria. Algunas plantas medicinales importantes con los índices más altos: A) *Azadirachta indica* A. Juss. B) *Acacia nilotica* Wild. C) *Prosopis cineraria* (L.) Druce. D) *Pongammia pinnata* (L.) Pierre. E) *Boerhavia diffusa* Linn. F) *Euphorbia hirta* Linn. G) *Calotropis procera* R. Br. H) *Sesamum indicum* Linn. I) *Syzygium cumini* (L.) Skeels.

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CONFLICTS OF INTEREST

No conflicts of interest.

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Appendix 1 (1 of 8). Medicinal plant species cited by informants for traditional medicine.

Apéndice 1 (1 de 8). Especies de plantas medicinales citadas por los informantes para la medicina tradicional.

Family	Scientific name	Local name	Habit	Parts used	Mode of use	Ailments uses	UV	RFC	FL(%)
Acanthaceae	*Adhatoda vasica* (Nees.)	Adusa	H	Leaves, roots	Paste, extract	**Jaundice**, diarrhea wound healing, headache	0.56	0.37	55.88
Acanthaceae	*Andrographis echioides* Ness	Kalmegh	H	leaves and stem	Decoction	**Fever**, body ache	0.43	0.25	34.78
Acanthaceae	*Blepharis maderaspatensis* Heyne ex Roth	Utingan / Dudhiya Choti	H	Whole plant, seeds	Paste decoction	Ulcer , **wound healing**, diabetes, throat troubles, asthma; nervous system, diuretic	0.84	0.50	28.26
Acanthaceae	*Elytraria acaulis* (L. fil.) Lindau	Nilakadambu	H	Root	Paste	Diabetes, diarrhea, **wound**, snake bite, pile	0.78	0.47	61.36
Acanthaceae	*Peristrophe bicalyculata* Nees.	Kali aghedi	H	Whole plant, leaves	Paste, extract	**Bone fracture**, sprain, fever, cold, cough, tuberculosis	0.40	0.27	36.00
Amaranthaceae	*Achyranthus aspera* Hook	Latjira / Chirchira	H	Leaves, roots, shoots	Paste, decoction	Wound healing, piles, skin diseases, **toothache**, abdominal pain	1.02	0.83	71.84
Amaranthaceae	*Pupalia lappacea* Juss.	Nagadaminee	H	Leaf, fruit	Paste, extract	Bone fractures, fever jaundice, **paralysis**	0.36	0.23	38.09
Amaranthaceae	*Chenopodium album* Linn.	Bathua	H	Whole plants	Extract, raw decoction	**Blood purifier**, diuretic, hepato protective, laxative, round and hookworms, enlarge spleen, heart problem, eye probelum	1.16	0.9	89.15
Anacardiaceae	*Rhus mysorensis* Heyen ex Wt. & Arn.	Dasni	T	Fruit, leaves, whole plant	Decoction paste	Dysentery, diabetes, **famine periods**, rheumatoid arthritis	0.37	0.19	38.88
Apocynaceae	*Carissa spinarum* Linn.	Jungli Karonda	S	Whole plant, fruits	Decoction	Respiratory diseases, **gastrointestinal infections** malaria fever, jaundice, cardiac diseases, diabetes	0.86	0.48	52.27

Appendix 1 (2 of 8). Medicinal plant species cited by informants for traditional medicine.

Apéndice 1 (2 de 8). Especies de plantas medicinales citadas por los informantes para la medicina tradicional.

Family	Scientific name	Local name	Habit	Parts used	Mode of use	Ailments uses	UV	RFC	FL(%)
Asclepiadaceae	*Calotropis procera* R. Br.	Madar	S	Root, stem leaves, root bark, latex	Powder, decoction paste	Fever, **rheumatism**, diarrohea, jaundice. leprosy, elephantiasis, asthma, cough, toothache. intestinal worms, skin disease	1.02	0.75	71.02
Asteraceae	*Artemisia scoparia* Waldst. &amp	Nagadouna	H	Leaves Powder, seeds	Raw, paste, powder	**Fever**, inflammation, jaundice	0.61	0.18	47.05
Asteraceae	*Blainvillea latifolia* DC	Kanghi	H	Leaves	Paste	**Skin cuts**, toothache, wound healing, snakebite	0.18	0.12	27.27
Asteraceae	*Glossocardia bosvallea* DC.	Patthar Suva	H	Leaves, root, arial part	Decoction extract	Wounds, colds, fever, **Kidney stone**	0.680	0.40	32.43
Asteraceae	*Parthenium hysterophorus* Linn.	Gajar ghas	H	Whole plant	Decoction extract	Skin inflammation, **rheumatic pain**, diarrhoea, urinary tract infections	0.29	0.23	36.36
Asteraceae	*Tridax procumbens* Linn.	Gharma	S	Whole plant, leaves, root, seed	Decoction	Diarrhea, **dysentery**, skin disorders,	0.34	0.26	45.83
Asteraceae	*Vernonia cinerea* (L.) Less.	Sahdevi	H	Leaves, whole plant	Decoction	**Chronic fevers**, diuretic, stomachic, cold, asthma, bronchitis	0.66	0.38	51.42
Asteraceae	*Xanthium strumarium* Linn.	Ghaghra / Chota dhatura	H	Leaves, stem	Raw, paste	Nasal sinusitis, headache, rheumatism, **arthritis**	0.42	0.34	38.70
Boraginaceae	*Trichodesma amplexicule* Roth.	Adhapushpi / Chota Kulpha	H	Roots, leaves	Powder, decoction	Dysentery, swellings of joints, **diuretic**	0.304	0.23	42.85
Capparaceae	*Capparis decidua* (Forssk.) Edgew.	Karira	T	Root, bark, leaves, buds fruits	Decoction Paste	Cough, asthma, **pyorrhea**, cardiac trouble, fever, boils	0.48	0.19	47.36
Celastraceae	*Maytenus senegalensis* Excell.	Kankero	S	Roots ,bark, leaves	Extract, paste, powder	Respiratory diseases, wounds healing, **rheumatism**, snakebites	0.30	0.14	23.07

Appendix 1 (3 of 8). Medicinal plant species cited by informants for traditional medicine.

Apéndice 1 (3 de 8). Especies de plantas medicinales citadas por los informantes para la medicina tradicional.

Family	Scientific name	Local name	Habit	Parts used	Mode of use	Ailments uses	UV	RFC	FL(%)
Commelinaceae	*Commelina bengalensis* Linn.	Kanchara	H	Whole plant	Juice, decoction	Burns, sore throats, **headache**, leprosy, fever, jaundice.	0.445	0.25	30.43
Convolvulaceae	*Ipomoea* nil Roth.	Kala Dana	H	Seeds, Root, flower leaves	Decoction, paste	Inflammations, constipation, **bronchitis**, fever, skin diseases	0.51	0.31	31.30
Convolvulaceae	*Evolvulus alsinoides* Linn.	Shankhapushpi	H	Root, whole plant	Decoction and powder	Dysentery, **strengthen the brain and memory**, chronic bronchitis, asthma	1.21	0.75	68.09
Convolvulaceae	*Ipomoea pes-tigridis* Linn.	Panch-patri / Ghiabati	H	Leaves, Roots, Whole plant	Extract, decoction paste	Wound healing, pimples, rabies, **headache**, snakebite	0.31	0.19	27.77
Convolvulaceae	*Rivea hypocrateriformis* (Desr.) Choisy	Phang	H	Leaves stem	Raw, decoction	Cough, asthma, rheumatic pain, fever, **urogenital problem**, snake bite, piles	0.61	0.27	36.00
Cyperaceae	*Cyperus triceps* (Rottb.) Endl.	Nirbishi	H	Root, whole plant	decoction Powdered	Fistula, tumors, **measles**, diarrhea, diabetes	0.39	0.18	32.94
Euphorbiaceae	*Croton bonplandianum* Bill.	Kala Bhangra	H	Seed oil, leaves	Decoction, powder, extract	Constipation, dandruff , scurvy, sprains, jaundice, **cholera**, boils, diarrhoea, eye diseases, rheumatism	0.71	0.41	36.84
Euphorbiaceae	*Euphorbia hirta* Linn.	Dudhi	H	Whole plant	Powder, decoction, extract	Female disorders, cough, **bronchitis**, asthma, dysentery, jaundice, pimples, tumors. gastrointestinal disorders, snake bites	1.06	0.53	59.18
Fabaceae	*Abrus precatorius* Linn H	Gunja / Rati	S	Roots, leaves, seeds	Paste, decoction	**Skin diseases**, cough, cold, fever, tetanus, rabies	0.40	0.35	53.12
Fabaceae	*Acacia catechu* (L.f.) Willd	Khair	T	Heartwood Bark	Extract, decoction, paste	Asthma, bronchitis, **mouth sores**, sore throats, ulceration, and wound healing	1.56	0.96	100

Appendix 1 (4 of 8). Medicinal plant species cited by informants for traditional medicine.

Apéndice 1 (4 de 8). Especies de plantas medicinales citadas por los informantes para la medicina tradicional.

Family	Scientific name	Local name	Habit	Parts used	Mode of use	Ailments uses	UV	RFC	FL(%)
Fabaceae	*Acacia leucophloea* (Roxb.) Willd.	Reonja / Safed babul	T	Bark	Powder, paste	Snake-bite **boils**	0.63	0.54	32.84
Fabaceae	*Acacia nilotica* (L.) Delile	Babul / Kikar	T	Leaves, roots, gum, bark	Extract, decoction , powder	Fever, asthama, **immunity booster**, ulcer, wounds, diarrhea, toothache common cold	1.65	0.99	89.01
Fabaceae	*Albizia lebbeck* (L.) Benth	Siris	T	Leaves, bark, flower, seeds	Powder, decoction extract	Insect bite, scorpion bite **Arthritis**, eye infection, throat infection	0.68	0.54	74.31
Fabaceae	*Butea monosperma* (Lam.)	Palash	T	Flowerswood pulp	Raw, decoction	**Liver disorders** diarrhoea, ulcers, sore throat, and snakebite	0.94	0.79	67.24
Fabaceae	*Cassia fistula* Linn	Amaltas	T	Leaves, fruits, root, seed	Decoction	Jaundice, diarrhea, constipation, cough, asthma, toothache, ringworm, **heart related illnesses**	0.94	0.75	68.11
Fabaceae	*Cassia obtusa* Roxb.	Senna / Chirauta	S	Root	Powder, extract	Swelling , **laxative**, liver protection	0.53	0.29	40.74
Fabaceae	*Cassia occidentalis* Linn	Kasaunda	S	Root, bark, leaf and flower Whole plant, seeds	Decoction powder paste extract	Cure sore eyes, hematuria, rheumatism, **typhoid**, asthma, diabetes, fracture and bone disease	0.72	0.39	47.22
Fabaceae	*Cassia tora* Linn.	Chakramadu	S	Leaves flowers fruit, root	Powder paste	Scorpion sting, ring worms, **constipation** ,leprosy, skin disorders	0.64	0.41	39.47
Fabaceae	*Indigofera linefolia* Retz.	Bhangra / Ratanjot	H	Root, leaves	Powder	Neurological disorders **immunity booster**	0.61	0.25	34.78

Appendix 1 (5 of 8). Medicinal plant species cited by informants for traditional medicine.

Apéndice 1 (5 de 8). Especies de plantas medicinales citadas por los informantes para la medicina tradicional.

Family	Scientific name	Local name	Habit	Parts used	Mode of use	Ailments uses	UV	RFC	FL(%)
Fabaceae	*Pongamia pinnata* (L.) Pierre	Karanj	T	Fruits seed, roots leaves bark ,oil	Juice, decoction powder	Ulcers, rheumatism, **leucoderma**, scabies, tumors, colds, coughs, diarrhea, leprosy, toothache	1.30	0.56	73.07
Fabaceae	*Prosopis juliflora* DC	Vilayti babul	T	Leaves, Fruits	Powder, Decoction	Diabetes, digestive system diseases, **kidney stones**, cancer	1.15	0.73	76.11
Fabaceae	*Prosopis cineraria* (L.) Druce	Shami	T	Leaves, Fruits wood	Paste, decoction, powder	Asthma, bronchitis, dysentery, piles leucoderma, **leprosy**, rheumatism, scorpion stings, muscle tremors	1.34	0.98	86.97
Fabaceae	*Tephrosia purpurea* Pers.	Sharpunkha	H	Root, seed pod, whole plant	Deccoction, extract, powder	Leprosy, allergic, **inflammatory rheumatism**, asthma, bronchitis	0.16	0.12	27.23
Fabaceae	*Zornia diphylla* Pers.	Two-Leaf Zornia	H	whole plant, leaves, root	Decoction, powder	**Jaundice**, dysentery	0.08	0.04	25.00
Lamiaceae	*Clerodendrum phlomidis* Linn.	Agnimantha	S	Leaves root	Powder, decoction	**Burnt skin**, muscular pain, digestive, fever problems, diabetes, headache, toothache, rheumatism swelling	0.37	0.27	36.00
Lamiaceae	*Leucas aspera* Spreng.	Thumbi	H	Leaves	Decoction	Fever, **larvicidal**, rheumatism	0.53	0.28	34.61
Lamiaceae	*Ocimum americanum* Linn.	Kali Tulasi	H	Seeds, leaves	Essential oils, decoction	**Fever**, **cold**, tuberculosis, constipation, larvicidal	0.48	0.35	40.60
Liliaceae	*Asparagus racemosus* Willd.	Satawar	S	Root	Powder	**Skin decaying** diarrhea, dysentery, epilepsy	1.21	0.71	73.84

Appendix 1 (6 of 8). Medicinal plant species cited by informants for traditional medicine.

Apéndice 1 (6 de 8). Especies de plantas medicinales citadas por los informantes para la medicina tradicional.

Family	Scientific name	Local name	Habit	Parts used	Mode of use	Ailments uses	UV	RFC	FL(%)
Malvaceae	*Abutilon indicum* (L.) Sweet	Atibala	H	Leaves, stem, roots, fruits, seeds	Powder, juice	**Leprosy**, urinary disease, jaundice, piles, wounds vaginal infections	0.77	0.61	57.12
Malvaceae	*Grewia tenax* (Forssk.) Fiori	Gangren, Vishvdeva	S	Leaves, root, fruit	Powder Extract	Dysentery, female reproductive problem, fever, **fracture**	0.41	0.22	28.57
Malvaceae	*Sida cordifolia* L.	Bala	H	Whole plant	Decoction powder	bronchial asthma, cold and flu, head ache, **aching joints and bones**, cough	0.89	0.65	59.53
Meliaceae	*Azadirachta indica* A. Juss.	Neem	T	Leaves Fruit seed bark	Powder, oil, decoction extract, paste	Wound healing, diabetes, blood purifier earache, **skin diseases**, constipation, hair lice, piles	2.40	0.99	97.80
Moraceae	*Ficus virens* Iton	Pilkhan	T	Bark	Decoction	**Leucorrhoea**, ulcers	0.32	0.21	23.76
Myrtaceae	*Syzygium cumini* (L.) Skeels	Jamun	T	Leaves Fruit seed	Raw, decoction, powder	Stomach pain, arthritis, heart issues, dysentery, stomach spasm, gingivitis, **diabetes**	1.35	0.98	98.23
Nyctaginaceae	*Boerhavia diffusa* Linn.	Punarnava	H	Aerial parts, roots	Decoction, powder	Hypertension, skin disease, constipation, respiratory diseases, abdominal pain, inflammation, **jaundice**	1.10	0.94	47.12
Pedaliaceae	*Sesamum indicum* Linn.	Til	H	Leaves, roots, seeds	Raw, Powder, oil	Liver and kidney protection, cardiovascular system protection, asthma, dry cough, ulcers, inflammation, urinary disease, **vertigo**, lung disease, migraine	1.82	0.96	86.36
Poaceae	*Cenchrus setigerus* Vahl	Kala Dhaman	H	Whole plant	Decoction	Allergies, fever, common cold, **intestinal worms**	0.12	0.05	40.00

Appendix 1 (7 of 8). Medicinal plant species cited by informants for traditional medicine.

Apéndice 1 (7 de 8). Especies de plantas medicinales citadas por los informantes para la medicina tradicional.

Family	Scientific name	Local name	Habit	Parts used	Mode of use	Ailments uses	UV	RFC	FL(%)
Poaceae	*Cynodon dactylon* Pers	Doob grass	H	Whole plant, root leaves	Juice, decoction paste	Diarrhea, **nose bleeding**, urinary tract infection, headache , piles, hypertension, snack bite, stone	0.56	0.33	51.61
Poaceae	*Saccharum spontaneum* Linn.	Kans	H	Root, leaves, whole plant	Decoction, extract	Cough, cold, Heat stroke, nose bleeding, constipation, piles, **mental illness**	0.24	0.13	41.66
Portulacaceae	*Portulaca grandiflora* Hook	Nonia	H	Leaves flower	Decoction, Raw	**Scurvy**, diabetes	0.53	0.40	56.75
Rhamnaceae	*Ziziphus mauritiana* Lam.	Ber	T	Fruit, root, leaves	Paste, powder, decoction, raw	Constipation, bleeding gums, coughs and headaches, **scabies**, diuretic	0.63	0.51	62.23
Rhamnaceae	*Zizyphus oenoplia* Mill.	Makoh	S	Root, leaves, bark	Raw, decoction	Abdominal pain, wound healing, sore throats, **dysentery**	0.15	0.08	37.5
Salicaceae	*Flacourtia indica* (Burm.f.) Merr.	Bilangada	T	Bark, leaves and root	Decoction extract	**Treat fever**, diarrhoea, diabetes	0.18	0.13	25.00
Salvadoracea	*Salvadora oleoides* Decne	Bada Peelu / Jal	T	Leaves, stem	Paste, decoction	Piles, tumors, bronchitis, rheumatism, **conjunctivitis**	0.14	0.10	44.44
Solanaceae	*Withania somnifera* (L.) Dunal	Ashwagandha	H	Leaf, root	Powder, decoction	**CNS disorders**, pain, liver disorders, fever, respiratory infections, asthma, diabetes, hypertension, arthritic	0.84	0.68	81.31
Tiliaceae	*Triumfetta rhomboidea* Jacq.	Burr Chiriyari	S	Flower, leaves, bark, root, and fruit	Powder	**Diuretic**, tumors, leprosy, anaemia, diabetic	0.12	0.06	33.33

Appendix 1 (8 of 8). Medicinal plant species cited by informants for traditional medicine.

Apéndice 1 (8 de 8). Especies de plantas medicinales citadas por los informantes para la medicina tradicional.

Family	Scientific name	Local name	Habit	Parts used	Mode of use	Ailments uses	UV	RFC	FL(%)
Verbenaceae	*Lantana camara* L.	Raimuniya	S	Leaves, root, flower whole plant	Decoction, extract	**Rheumatic pain**, snake bite, wound healing, headache, tetanus, cold, eye injuries, whooping cough	0.73	0.47	42.85
Zygophyllaceae	*Balanites roxburghii* Planch	Hingota / Ingoriyo	T	Bark, fruits, seeds, latex, leaves	Oil, extract, decoction	Whooping cough, ,skin diseases, dog bite, treat tumors, constipation, **epilepsy**	0.369	0.29	38.09
Zygophyllaceae	*Tribulus terrestris* Linn.	Gokshura / Gokharu	H	Leaves, fruit, root	Paste, powder	Inflammation, leprosy, **general weakness**, genitourinary tract disorders, cardiotonic, central nervous system	0.75	0.47	47.72

References: **H**, Herb; **S**, Shrub; **T**, Tree; **UV**, Use value; **RFC**, Relative frequency citation; **FL**, Fidelity level (for ailments bold written).