

Medicinal plants used for various health issues by rural inhabitant of Wayanad forest division-Kerala, India - A statistical analysis

Venkatesan K^{*1}, Mohd Asif¹, Mokhtar Alam², Kabiruddin Ahmed¹, R. Murugeswaran³,
N. Zaheer Ahmed²

¹Regional Research Institute of Unani Medicine, Chennai, Tamil Nadu, India

²Central Council for Research in Unani Medicine, M/o of AYUSH, Govt. of India, New Delhi, India

³National Medicinal Plant Board, M/o of AYUSH, Govt. of India, New Delhi, India

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Abstract



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Native peoples of Wayanad use a wide range of plants medicinally. Many of these Plants have profound meaning to their users. Quantitative ethnobotany deals with the computation and importance of plants and vegetation to people. It helps quantification of qualitative data in biological and social sciences. The traditional source of medicinal plants is an important way for daily curative uses in the rural area. A survey was carried out among the tribes of Wayanad forest division, Wayanad district, Kerala India. The present study identified traditionally using 64 species of ethnomedicinal plants distributed in 61 genera belonging to 42 families to treat various diseases. Moreover, among the plant habit wise analyzed there are 16 herbs, 9 shrubs, 10 Climbing shrubs, 25 trees, 3 Small trees and 1 Twiner. The status of plants was analyzed and recorded as 44 rare, 14 Common, 3 extinct, each one in Endangered, Least common and sporadic in this study area. In this communication, the information got from the rural inhabitants was compared with the already existing literature. The data were collected randomly from tribal and healers of 149 informants and the data were statistically analyzed by using suitable statistical tools such as Use Value (UV), Informant Consensus Factor (ICF), Fidelity Value (FL) and various ranking methods.

*Corresponding Author

Name: K. Venketasan
Phone: +91 9865326547
Email: venkat050373@gmail.com

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1. INTRODUCTION

Some wild plant resources are severely threatened by habitat loss and species-selective overexploitation. In addition, indigenous knowledge about the uses of wild plant resources is rapidly disappearing from traditional communities. In the context of conservation, sustainable and equitable use of wild plant resources, quantitative ethnobotany can contribute to the scientific base for management decisions.

In order to enhance the indicative value of ethnobotanical studies, attempts have been made in recent years to improve the traditional compilation-style approach through incorporating suitable quantitative methods of research in ethnobotanical data collection, processing and interpretation. Such quantitative approaches aim to describe the variables quantitatively and analyse the observed patterns in the study, besides testing hypotheses statistically. The concept of quantitative ethnobotany is relatively new and the term itself was coined only in 1987 by Prance and coworkers (1). Quantitative ethnobotany may be defined as "the application of quantitative techniques to the direct analysis of contemporary plant use data" (2). Quantification and associated hypothesis testing help to generate quality information, which in turn contributes substantially to resource conservation and development. Further, the application of quantitative techniques to data analysis necessitates refinement of methodologies for data collection. Close attention to methodological issues not only improves the discipline of ethnobotany but also enhances the image of ethnobotany among other scientists (Phillips & Gentry 1993a and b).

Quantitative ethnobotany survey involves the use of quantitative techniques for direct analysis of the data on utilization of the existing plants. The quantitative methods were proposed by Phillips, led to an increasing awareness for ethnobotanical research [3]. Ethnomedicinal studies have proved significance in valuing and discovery of contemporary drugs from indigenous medicinal plant resources. There are appropriate sources of information about useful medicinal plant species, which can be targeted for management and domestication [3, 4]. Flowers are playing an important role in our day-to-day life directly or indirectly. They have been an integral part of human beings since ancient times for various purposes like ornamental, decorations, medicine (fresh, distillates, decoction and powdered form), nutrients/foods (fresh garnishes, dried, in cocktails, canned sugar), during religious rites, to pray gods, culinary preparations, essential oils, and in beauty care products etc.,. The traditional primary health care system in India is embodied in a 'people's health culture'. This culture is based on very effective and sound, region-specific health

practices involving 8,000 species of plants across the country where flowers play a prominent role among them. For several centuries medical practitioners have long been acknowledged the therapeutic properties of certain flowers. The kingdom of flowers is very vast as we can categorize them in general into four main classes depending upon the purpose for which they are grown, i.e. ornamental, commercial, medicinal and vegetable or edible flowers. Flower therapy uses essential oils, flower waters, flower juice, flower petals (fresh and dried), and aroma to heal mind and body. Because of medicinal properties of flowers, modern medicines use flower extracts. The significance of flowers is evaluated from the aspect of potential health benefits concerning mainly the influence of color, odor and flavor components in relation to antioxidant activity, scavenging activity of reactive oxygen radicals and against cancer [5].

Historically apart from medicinal usage, Plants and flowers also used for edible purposes, for example in ancient Rome, various species of Roses were used in cooking of different kinds of puree and omelets; in medieval France *Calendula officinalis* in preparation of salads; saffron (*Crocus sativus*) as flavoring agent; *Viola odorata* for coloring of sugar, syrups and various potions; *Borago officinalis* and Roses as aromatic enhancers of pastry and dandelion (*Taraxacum officinale*) flowers for preparation of drinks and salads in Europe [6]. Out of the total 4, 22,000 flowering plants reported from the world, more than 50,000 plants are used for medicinal purposes. In India, more than 43% of the total flowering plants are reported to be of medicinal importance [7]. The utilization of plants for medicinal purposes in India has been documented in ancient Indian literature. Extensive information is available about flowers from Indian literature like *Vrukshayurveda*. In Indian traditional systems of Medicine *Ayurveda*, *Siddha*, *Unani* and *Homoeopathy system* (prevalent mostly in South India), flowers are used in the treatment of various ailments.

Plants are directly eaten as raw or made as juice decoction, tincture or mixing them with some other ingredients and then administered. Different formulations of plants are used as Juice, Powder, Syrup, *Arka* (Distilled extract), scents,

soups etc, [8]. The kingdom of flowering plants is very vast. In general, plants can be categorized into four main classes depending on the purpose for which they are grown i.e. Ornamental plants, Commercial plants, Medicinal plants, and Kitchen/Vegetable flowering plants [9].

Hence the present study was made to list out the naturally growing wild plants that were collected from forest area by the indigenous community tribes from Western Ghats of Wayanad district of Kerala for food and medicine, and to conserve those plants for their future generations. From the earlier studies, it is suggested that the ethnopharmacological survey in Western Ghats is incomplete and traditional herbal healing knowledge of a large number of folk communities need documentation in reference to various ailments from tribals of Western Ghats of WWayanad An attempt has therefore been made to collect and document the folk knowledge from tribals, local herbal healers and knowledgeable elder people of different castes and communities residing in certain forest area of Western Ghats of Wayanad district of Kerala.

- Objective of this study was to interact with local traditional healers, tribal's and document their knowledge on medicinal uses of plants.
- To collect scientific information and identify the Plants used by the tribal and rural people of the study area.
- Documentation techniques for recording of medicinal flora and traditional medical knowledge of local informants about the usages of the indigenous available plants for curing of various ailments and diseases.
- Collection of data on the traditional treatments against various ailments, which forms the basis of consideration of any flower plant taxon. Thus, the evaluation of the data using various quantitative ethnobotanical indices for exploration of most popular plants species, which could be further subjected for the discovery of potential therapeutic phytomolecules.
- A large number of plants are still unexplored regarding their uses as food and medicine. So one of the objectives of the present work was preparation of a report on plants used as non formal food and medicinal resources by the

tribal and rural people of Wayanad District district of Western Ghats of Kerala.

- To provide status and conservation strategies of the plant in order to conserve the plants which are endangered, vanishing or in the verge of extinction.

2. STUDY AREA

2.1 Wayanad District

The name Wayanad is believed that have been derived from the word Vayalnadu meaning the land of paddy fields. The Wayanad district lies between north latitude 11 ° 27' and 15 ° 58' and east longitude 75 ° 47' and 70 ° 27'. It is bounded on the east by Nilgiris and Mysore districts of Tamil Nadu and Karnataka respectively, on the North by Coorg district of Karnataka, on the South by Malappuram and on the West by Kozhikode and Kannur districts. The Western Ghats Mountains in Wayanad are rich in flora and fauna located at a distance of 76 km from the sea shores of Kozhikode. The altitude varies from 700-2100mts above sea level. As for the forest vegetation are concern evergreen, semi-evergreen, shola, deciduous, and dry deciduous forests are distributed all over the district. Annual rainfall is about 3000 to 4000 mm.

2.2 Wayanad Forest Division

Two forest divisions are there in Wayanad district, the South Wayanad forest division comprises of 3 forest ranges which includes- Kalpatta, Mepadi and Chedleth forest ranges. Particularly the forest areas Chambera, Attamalai and Manikunthmala in Mepadi range, Ladys smith, Bible land, and Padinarathra forest areas in Kalpetta range, Pampra, Pathiri South, and Kuruva island forest areas in Chedleth range are rich in floristic diversity. The forest areas such as Chamberapeak, Arunagiri, Attamala, Manikunthmala, Parapanpara, Soochipara and Vengaishola forest areas in Meppadi Range, Lady's Smith, Meenmutti, Bibleland, Thandiudu, West land, Kuricharmala, Suganthagiri and Mandamala forest areas in Meppadi Range and Kuruva island, Padiri North, Padiri South forest areas in Chedleth Range were surveyed and carried out plant exploration activities. During the Ethnobotanical survey programme the climate in the study area was rainy, the annual rainfall was recorded about 3000-4000 mm in previous years. The tribal

communities such as Irular, Kadas, Paniyas, Kattunayakans and Kuruchiars are settled in different part of the district. The survey team visited some of the tribal colonies such as Soochipara, Parapanpara in Meppadi Range, Kuttianvayal, Suganthagiri, Ampa in Kalpetta Range and Padiiri South in Chedleth Range. During the study the researchers interacted with the tribal and local peoples and recorded information on folk medicinal plants and wild fruits.

3. Methodology

A preliminary survey of tribal villages in Wayanad district revealed that local communities used wild flowering plants as medicine for their healthcare extensively. Frequent field surveys were made in wayanad district. Each area was visited twice in different seasons in 2010-2011. Ethnobotanical data (Botanical name, local name, mode of consumption and ethnobotanical uses) were collected through interviews and discussions with the tribal practitioners in and around the study area. Data were also collected through questionnaires in their local languages (Malayalam and Tamil). Information was collected through interview with one hundred and forty-nine (149) persons having aged from 40-80, and having traditional knowledge of wild fruit plants. In addition to the vernacular names, questions were also asked about each plant prescribed, such as part of the plants used, medical uses, detailed information about the mode of preparation (i.e., decoction, paste, pills, powder and juice); from the usage either fresh or dried and mixtures of other plants used as ingredients were also collected. The claims were compared with available important works on Indian ethnobotany and medicinal plants such as [10-12].

The identified plant specimens were then confirmed through a referral tour programme with the herbaria of Botanical survey of India, Coimbatore. The specimens were deposited in the herbarium of survey of the medicinal plant unit, Regional Research Institute of Unani Medicine, Chennai. The tribal information is also kept in the same institute, voucher specimens along with other details are given in Table-1.

The knowledge about medicinal plants is rather specialized and is limited to a few members in the tribal community who are recognized as 'Vaidhyar' (also known as medicine men, informant and

traditional healer). Traditional healers commonly begin their training as children or teenagers working as assistants to their mothers, fathers, and to other relatives who are recognized healers. After having trained for a number of years, the apprentice will be ceremonially granted the authority to use a given treatment. This individual will be recognized by others in their culture as having mystical power to heal, as well as having the power to train others in the use of medicinal plants.

4. DATA COLLECTION

The ethnomedicinal information was collected through general conversations with traditional healers and questionnaires were used to gather their knowledge. Details of medicinal plants used, mode of treatment, methods of preparation and types of administration were documented by interacting with them as well as through direct observations. The information obtained from the tribals was recorded in field notebooks, ethnobotanical data collecting performa sheet and compared with the previously reported literatures [10, 15, 16]. The collected medicinal plant species were identified by the local people with their vernacular names, photographed and sample specimens were collected for the preparation of the herbarium. The Flora of Presidency of Madras [13] and The Tamil Nadu Carnatic [14] were used to ascertain the nomenclature. The voucher specimens were deposited in the herbarium at Regional Research Institute of Unani Medicine, Chennai.

4.1 Statistical Analysis (Quantitative analysis)

4.1.1 Use Value (UV)

The relative importance of each plant species known locally and to be used as herbal remedy is reported as use value (UV) and it was calculated using the following formula [16]

$$UV = \Sigma U/n$$

Where UV is the use value of a species, U is the number of use reports cited by each informant for a given plant species and n is the total number of informants interviewed for a given plant.

1.1.2. Factor Informant consensus (FIC)

The ICF was used to analyse the agreement degree of the informants' knowledge about each category

of ailments [16,17]. The ICF was calculated using the following formula:

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

Where **Nur** stands for the number of use reports of informants for a particular illness category, and **Nt** is the number of species used by all informants for a particular illness.

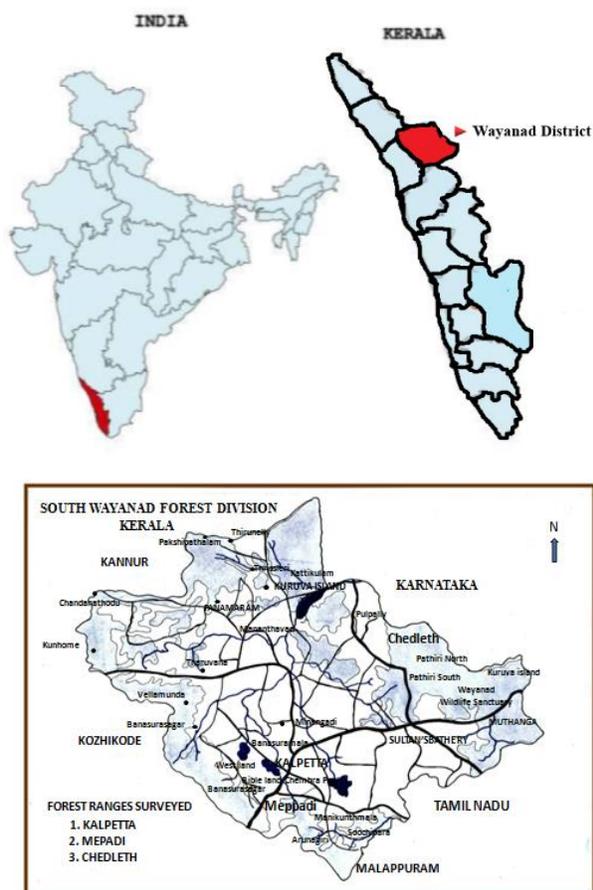
1.1.3. Fidelity level (FL)

The **FL** was employed to determine the most important plant species used for treating certain diseases by the local herbal practitioners and elderly people living in the study area [19-21]. The **FL** was calculated using the following formula:

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

Where N_p is the number of informants that mentioned the specific plant species used to treat certain ailments, and N is the total number of the informants who utilized the plants as medicine for treating any given ailment.

MAP OF STUDY AREAS OF WAYANAD FOREST OF WESTERN GHATS



4. Present knowledge on local folk medicine

Ethnobotanical knowledge has been documented from various parts of Indian sub-continent. [22]. In Kerala state, ethnomedicinal value of wild fruit plants in possession of various tribal and rural folk communities for treating various diseases have been done to some extent [23-25]. A perusal of the literature reveals that several ethnobotanical studies among various tribals have been reported from the various district of this state except Wayanad district, which has not yet been studied from the quantitative Ethnobotany point of view.

5. RESULT AND DISCUSSION

The art of herbal healing has very deep root in Indian culture and folklore. Medicinal plants have been playing an important role in the survival at the ethnic communities, who lives in remote villages and forests. Traditional folk medicine, which is mostly undocumented, has been handed down orally from one generation to another. Large sections of the Indian population still rely on traditional herbal medicine. Even today in most of the forest tribal are depending on local traditional healing systems for their primary health care. Their reliability on only healing plants is still more for the tribal people inhabiting the deep forest of Western Ghats of Kerala in India, where it is difficult for them to get modern medical facilities for their day to day problems. So keeping all this things in mind, the present study was taken into account. The paper focus on the plants used by tribals and rural peoples of Study area.

The present study identified that the traditional healers used medicinally used species (distributed in 61 genera belonging to 42 families) ethnomedically to treat various diseases such as dry cough, menstrual disorders, piles, viral fever, kidney stone, joint pain, jaundice, skin diseases, contraceptive purpose etc., (Table-1). Moreover life forms of medicinally used flowers are 16 herbs, 25 trees, 9 shrubs, 10 climbing shrub, 3 small tress and 1 twiner were recorded. The statuses of plants includes 44 rare, 145 common, 3 extint, each one in endangered, leas common and sporadic were observed in the study area.

The following plants are used for various ailments they are *Borago officinalis* L. (Gul-e-Gaozaban) used for kidney stone, *Butea monosperma* (Lam.) Taub. (Gul-e-Tesu) used for joint pain, *Calotropis*

gigantea (L.) R. Br. (Madar) used dry cough, *Ipomoea bona-nox* L. (Gul-e-Chandni) used for eczema. *Pentapetes phoenicea* L. (Gul-e-Dopaharya) used for tumours, *Pterocarpus marsupium* Roxb. (Gul-e-Bijasar) used for chronic fever, *Syzygium jambos* L. (Alston) (Gul-e Gulab Jamun) used for Jaundice, *Toona ciliata* M.Roem. (Gul-e-Tun) used for irregular menstruation.

In the present study statistical analysis revealed that the 64 plant species of wild flowers (Only Flowers parts of plant) used by 149 informants of age 40-80 for ethnomedicines. The commonly used plant species includes *Mallotus philipensis* Mul.Arg. (Euphorbiaceae) popularly known as Senthuram, with highest UV of 0.63 by 94 informants used for Skin diseases. Followed by leaves of *Ruta graveolens* L. (Rutaceae) Aruvatham with UV of 0.63 by 94 informants used for Rheumatic pain and *Mucuna pruriens* (L.) DC. (Fabaceae) with UV of 0.63 by 94 informants used for sexual disorders. *Andrographis alata* (Vahl) Nees. (Acanthaceae) with UV of 0.62 by 92 informants which is used for asthma. *Entada scandens Benth.* (Fabaceae) with UV of 0.62 by 92 informants used for sexual disorders where analyzed. (Table-1).

The species with lowest Use Value was observed *Mesua ferrea* L. / (Guttiferaceae) with UV of 0.28 by 42 Urinary Disorders, Reduce fever, Leprosy and Itching. *Chlorophytum borivilianum* Santapau & R.R.Fern. / Asparagaceae (Liliaceae) UV of 0.32 by 48 informants used for Alleviating sexual disorders and *Matricaria chamomilla* L./Asteraceae Used for for Inflammation and *Pentapetes phoenicea* L./ Malvaceae used for jaundice, these three plants was analyzed with UV of 0.32 by 48 informants. (Table-1)

In order to analyze the general usage pattern of plants, the informant's consensus factor (Fic) was used to highlight the plant use in particular ailments categories and agreement with use of plants. This will helps in the selection of plants for pharmacological and phytochemical studies. Moreover, the Informant consensus Factor (FIC) was analyzed with 67 Diseases divided as 14 ailments categories among them highest value was observed in Endocrinal disorders and Liver & jaundice as Fic Value:1.01 at same the lowest value was observed in determetalogical infection, sexual disorders / genitourinary ailments,

circulatory/cardio, vascular disease, skeleton-muscular and neuro system disorders, respiratory system disorders, fever/chronic fever as Fic Value :0.98 (**Table: 2**). Similar research have been reported by other ethnobotanists [26, 27].

This is consistent with other general observations which have been reported and recorded earlier in relation to medicinal uses of flowers studies by the Indian system of medicines like Siddha, Ayurveda and Unani [17,28,29]. Most of the plants, mainly used as food, also have medicinal importance. Many plants are used for skin and hair care. Essential oils impart benefits in perfumery, shine or conditioning effects [30]. In India, thousands of plant species have been used as food and medicine in folk, ayurvedic, unani, siddha and other systems recorded since 1000 BC [31, 32].

Antioxidant activities of indigenous foods and plant medicines that are necessary for health culture as well as economic stability of village people are being explored in different parts of the globe. Village people, women and children gather the plants and deciduous petals as food; and also a number of plants species consumed by them. Plants are rich in phenolic compounds and have antioxidant potential. Collection of deciduous petals rich in phenolic compounds is an eco-friendly practice and better than incineration in forests.

6. CONCLUSION

Medicinal plants are playing an important role in our day to day life directly or indirectly. From time immemorial, plants have been used as a restorative agent for a variety of ailments. They are the natural drugs used to regain the alterations made in normal physiological system by foreign organisms or by any malfunctioning of the body. It is very essential to have a proper documentation of medicinally used pants, flowers and their potential for the improvement of health and hygiene through an ecofriendly system. The available literature regarding the pharmacological properties of these plants and flowers are very impressive. The present study showed that traditional healthcare systems using medicinal plants is still prevalent in the studied areas, and it underlines the importance in the documentation of traditional ethnomedicinal knowledge before losing this diverse resource.

Table 1 List of medicinal plants used for various health issues by rural inhabitant of Wayanad forest division - Kerala, India

S.No	Botanical Name / Family / Voucher Specimen No:	Local Name/ English Name	Parts used & Mode of Application and Use	Habit/ Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
1	<i>Abrus precatorius</i> L./Fabaceae/ Voucher Specimen No: 8929	Kundu mani/ Rosary pea	Seed paste applies externally for inflammation. Seed soaked in coconut oil to apply for hair growth. Seed jewels used for antiseptic and Skin diseases.	Climbing Shrub/ C	58	0.39	38.92
2	<i>Acorus calamus</i> Linn. / Araceae / Voucher Specimen No: 11732	Vasambu/ Sweet Flag, Bach	Rhizome paste apply externally for head ache	Aromatic marsh herb/ Least Concern	62	0.41	41.61
3	<i>Amorphophallus sylvaticus</i> (Roxb.) Kunth / Araceae / Voucher Specimen No:13665	Kaattu Karunai / kattuchena	Powdered rhizome orally given for piles	Herb/ C	62	0.41	41.61
4	<i>Andrographis alata</i> (Vahl) Nees/ Acanthaceae/ Voucher Specimen No: 11868	Nilakan giram/ green chiretta	100ml leaf extract orally given with honey for asthma.	Herb/ R	92	0.62	61.74
5	<i>Asparagus racemosus</i> Wild. /Liliaceae/ Voucher Specimen No: 11857	Satavari / Root tuber	100ml root decoction is orally given for stomach ulcers.	Shrub/ R	88	0.59	59.06
6	<i>Bacopa monnieri</i> (L.) Pennell. / Scrophulariaceae / Voucher Specimen No: 2550	Neer Brahmi / Waterh yssop, Brahmi	Whole plant boiled with coconut oil and apply externally for nervous disorders	Aromatic marsh herb/ R	81	0.54	54.36
7	<i>Bombax ceiba</i> L./ Bombacaceae / Voucher Specimen No: 9755	Elavam / Silk Cotton Tree	10g Unripe young fruit powder orally given daily with hot water for increase sperm counting.	Tree/ R	86	0.58	57.72

Table 1 List of medicinal plants used for various health issues by rural inhabitant of Wayanad forest division - Kerala. India (Continued...)

S.No	Botanical Name / Family / Voucher Specimen No:	Local Name/ English Name	Parts used & Mode of Application and Use	Habit/ Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
8	<i>Borago officinalis</i> L. / Boraginaceae / Voucher Specimen No: 9955	Kallutai tumapi / Borage	10 g Seed powder boiled in 200 ml decoction orally given for Kidney stone. Seed powders made in to paste and apply for eczema.	Herb/ R	83	0.55	55.70
9	<i>Bridelia retusa</i> (L.) A.Juss./ Euphorbiaceae/ Voucher Specimen No: 9731	Mulluvangai/ Spinous Kino Tree	Fruits eaten as raw for anemia	Tree/ R	61	0.41	40.94
10	<i>Buchanania cochinchinensis</i> (Lour.) M.R. Almedia. / Anacardiaceae / Voucher Specimen No: 13769	Charam / Almond ette Tree, Chironji	Seeds taken orally daily with cow milk for increase sperm count	Tree/ R	63	0.42	42.28
11	<i>Butea monosperma</i> (Lam.) Taub. / Fabaceae/ Voucher Specimen No: 9673	Porasu/ Flame Of The Forest	Dried flower made in to paste with coconut and apply externally for joint pain.	Tree/ C	82	0.55	55.03
12	<i>Caesalpinia crista</i> (L.) Roxb./ Caesalpinaceae / Voucher Specimen No: 12524	Kachak ai/ Crested Fever Nut	Seed pastes with neem oil externally apply for skin rashes. Seed kernel 10 g orally given with hot water for stomach pain.	Climbing Shrub/ C	81	0.54	54.36
13	<i>Calophyllum inophyllum</i> L. / Clusiaceae/ Voucher Specimen No:9016	Punnai Maram / Alexandrian Oil-nut Tree laurel,	Oil is externally used for ring worm, Seeds made in to jewel and wear as chain for skin diseases.	Tree/ R	63	0.42	42.28

Table 1 List of medicinal plants used for various health issues by rural inhabitant of Wayanad forest division - Kerala, India (Continued...)

S.No	Botanical Name / Family / Voucher Specimen No:	Local Name/ English Name	Parts used & Mode of Application and Use	Habit/ Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
14	<i>Cananga odorata</i> (Lam.) Hook. f.&Thomson / Annonaceae/ Voucher Specimen No: 10138	Karumu kai/ Ylang-ylang tree Kattush anpaga m	100 ml flowers decoction orally given for Malarial fever	Tree/ R	82	0.55	55.03
15	<i>Careya arborea</i> Roxb./ Lecythydaceae / Voucher Specimen No: 13213	Pelaima ram/ Wild Guava	Bark powder externally apply with neem oil for skin diseases	Tree/ C	62	0.41	41.61
16	<i>Carissa carandas</i> L. /Apocynaceae/ Voucher Specimen No:10089	Kilakai/ Crane Berry	Fruit used as pickle for indigestion, 20-50ml fruit juice orally given to urinary irritation.	Shrub/ C	74	0.50	49.66
17	<i>Carthamus tinctorius</i> L. Asteraceae/ Voucher Specimen No: 10027	Kusumbu chedi/ Saff flower	100ml flowers decoction orally given for fever	Herb/ R	63	0.42	42.28
18	<i>Celastrus paniculatus</i> L. /Celastraceae/ Voucher Specimen No: 12242	Malkangan/Intellect plant	Fruit juice 100ml daily orally given for nervous weakness. Seed soaked in coconut oil to apply externally as massage for paralysis.	Climbing Shrub/ R	72	0.48	48.32
19	<i>Chlorophytum borivilianum</i> Santapau & R.R.Fern. / Asparagaceae (Liliaceae) / Voucher Specimen No: 10059	Taniravi thang/ Borivili, Safed Musli	Root powder orally given with milk for Alleviating sexual disorders.	Herb/ R	48	0.32	32.21
20	<i>Cipadessa baccifera</i> (Roth) Mig. / Meliaceae/ Voucher Specimen No:11356	Pulipan chedi/ Ranabil i	Fruit juice used as gargle for bleeding and swelling gum.	Shrub/ C	81	0.54	54.36

Table 1 List of medicinal plants used for various health issues by rural inhabitant of Wayanad forest division - Kerala. India (Continued...)

S.No	Botanical Name / Family / Voucher Specimen No:	Local Name/ English Name	Parts used & Mode of Application and Use	Habit/ Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
21	<i>Citrullus colocynthis</i> (L.) Schard./Cucurbitaceae/ Voucher Specimen No:12314	Athuthu mati/ Bitter apple	Fresh fruit paste apply externally for joint pain Dried fruit powder 10g orally given with hot water for Diabetic.	Creeping Shrub/ C	91	0.61	61.07
22	<i>Commiphora mukul</i> (Hook. ex Stocks) Engl. / Burseraceae / Voucher Specimen No: 13716	Guggul/ Mahisaki guggalu	Resin Powder made in to paste with coconut oil then apply in externally for Inflammation of Arthritis.	Tree/ R	52	0.34	34.89
23	<i>Costus speciosus</i> (Koen.) J.E. Smith / Costaceae/ Voucher Specimen No: 11913	Kostum / Crepe-ginger	100ml decoction of leaf is orally given twice daily for menstrual disorders.	Herb/ C	83	0.55	55.70
24	<i>Crescentia cujete</i> L./ Bignoniaceae/ Voucher Specimen No:10943	Thiruvodu maram (Beggars bowl)/ Calabash tree	Fruit pod smoke inhaled for Asthma. Pod powder apply externally with neem oil for skin diseases.	Tree/ E	72	0.48	48.32
25	<i>Croton tiglium</i> L./ Euphorbiaceae/ Voucher Specimen No:11293	Neervelam/ Purging Croton	Fruit pastes externally apply for swellings and skin diseases. Fruit soaked in coconut oil externally apply for Paralysis.	Small tree/ R	81	0.54	54.36
26	<i>Curculigo orchioides</i> Gaertn. /Hypoxidaceae / Voucher Specimen No: 12588	Nilappanai/ Black Musli	Root Powder orally given with milk for sexual disorders.	Herb/ R	64	0.43	42.92
27	<i>Curcuma aromatic</i> Salisb. / Zingiberaceae/ Voucher Specimen No: 11846)	Kasturi manjal/ Rhizome	Rhizome made into paste with cow milk and externally applied on face for dark patches.	Herb/ R	72	0.48	48.32

Table 1 List of medicinal plants used for various health issues by rural inhabitant of Wayanad forest division - Kerala, India (Continued...)

S.No	Botanical Name / Family / Voucher Specimen No:	Local Name/ English Name	Parts used & Mode of Application and Use	Habit/ Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
28	<i>Decalepis hamiltonii</i> Wight.& Arn./ Asclepiadaceae / Voucher Specimen No: 11898	Mahaali Kizhanku/ Peru Nannari	100 ml Decoction of root orally given as anti diabetic.	Climber/ EN	68	0.46	45.63
29	<i>Debregeasia longifolia</i> (Burm.f.) Wedd./ Urticaceae/ Voucher Specimen No:9606	Cakavattam/Wild Rhea	Fruit juice 100ml orally given for stomach ulcers.	Shrub/ R	63	0.42	42.28
30	<i>Elaeagnus kologa</i> Schlttdl./ Elaeagnaceae / Voucher Specimen No:11493	Kattumthiranga/ Kolungai	Fruit eaten as raw for sexual disorders.	Woody straggling shrub/ R	74	0.49	49.66
31	<i>Embelia ribes</i> Burm.f./ Primulaceae/ Voucher Specimen No:10173	Vayi Vilangai / False Black Pepper	100 ml Fruits decoction given for stomach problems and intestinal worms	Shrub/ R	76	0.51	51.00
32	<i>Entada scandens</i> Benth./ Fabaceae/ Voucher Specimen No:11460	Kurinjakai/ Elephant creeper	20g Seed powder orally given with milk for sexual disorders.	Climbing Shrub/ R	92	0.61	61.71
33	<i>Fagraea ceilanica</i> Thunb./ Gentianaceae/ Voucher Specimen No:11863	Marutankaimaram / Perfume Flower Tree	Fruit paste uses as fly glue to control diseases transmitting fly/insect repellent.	Tree/ Rare	87	0.58	58.39
34	<i>Garcinia gummitutta</i> (L.) Robs./Clusiaceae/ Voucher Specimen No:11154	Kodampuli/ Garcinia cambogia	Fruit used as pickle and 10-20 ml of juice orally given for obesity.	Tree/ C	72	0.48	48.32
35	<i>Gardenia gummifera</i> L.f. / Rubiaceae / Voucher Specimen No: 12118	Sirukambil/Gummi cape jasmine	Flowers boiled in water and apply externally for boils in eye lid and ears.	Small Tree/ R	58	0.39	38.92

Table 1 List of medicinal plants used for various health issues by rural inhabitant of Wayanad forest division - Kerala. India (Continued...)

S.No	Botanical Name / Family / Voucher Specimen No:	Local Name/ English Name	Parts used & Mode of Application and Use	Habit/ Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
36	<i>Gymnema sylvestre</i> (Retz.) Schult. / Apocynaceae (Asclepiadaceae) / Voucher Specimen No: 13526	Kogilam/ Small Indian Ipecae	5 g Leaves powder orally given with hot water for reduce Blood glucose	Climbing Shrub/ R	52	0.34	34.89
37	<i>Hedychium spicatum</i> Sm. / Zingiberaceae/ Voucher Specimen No:13267	Moolankizhangu/ Spiked ginger	Flower paste apply externally for headache and fever.	Herb/ R	64	0.43	42.92
38	<i>Helicteres isora</i> L. / Sterculiaceae/ Voucher Specimen No:12288	Valampuri edampuri/ East Indian Screw Tree	Fruit soaked in coconut oil and apply hair for reduce hair fall.	Tree/ C	62	0.41	41.61
39	<i>Hydnocarpus wightiana</i> Bl / Flacourtiaceae/ Voucher Specimen No: 11865	Maravetti/ Chaulmoogra	1. Seed oil externally applied for rheumatic pain. 2. Bark powder used as shampoo for dandruff.	Tree/ R	68	0.46	45.63
40	<i>Ipomoea bona-nox</i> L./ Convolvulaceae/ Voucher Specimen No: 13257	Naganamukkorai/ Belle de Nuit	Flower paste externally apply for Eczema	Twiner/ R	52	0.34	34.89
41	<i>Kaempferia galanga</i> L. / Zingiberaceae/ Voucher Specimen No: 11939	Kacholam/ Aromatic Ginger	10-15gm of rhizome powder is orally given with hot water for bleeding piles.	Herb/ R	58	0.39	38.92
42	<i>Mahonia leschenaultii</i> (Wallich ex Wight & Arnott) Takeda / Berberidaceae / Voucher Specimen No: 12011	Mullum anjanathi/ Toda Plant	The wood powder externally apply with coconut oil for eczema.	Erect Shrub/ R	52	0.34	34.89

Table 1 List of medicinal plants used for various health issues by rural inhabitant of Wayanad forest division - Kerala, India (Continued...)

S.No	Botanical Name / Family / Voucher Specimen No:	Local Name/ English Name	Parts used & Mode of Application and Use	Habit/ Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
43	<i>Mallotus philipensis</i> Mul.Arg ./ Euphorbiaceae/ Voucher Specimen No:10004	Senthuram/ Kamala Tree	Fruit pastes apply externally for Skin diseases.	Tree/ C	94	0.63	63.08
44	<i>Matricaria chamomilla</i> L./Asteraceae/ Voucher Specimen No: 10200	Mukuthi poo/ Chamomile	Flower paste with coconut oil apply externally for Inflammation	Herb/ R	48	0.32	32.21
45	<i>Mesua ferrea</i> L. / Guttiferaceae / Voucher Specimen No: 13872	Karungu/ Naarmushk	Urinary Disorders, Reduce fever, Leprosy, Itching.	Tree/ R	42	0.28	28.18
46	<i>Mucuna pruriens</i> (L.) DC. / Fabaceae/ Voucher Specimen No:12194	Punaikali/ Cowhage	10g Seed powder orally given for improve nervous weakness and sexual disorders.	Climbing Shrub/ R	94	0.63	63.08
47	<i>Nyctanthes arbor-tristis</i> L. / Oleaceae / Voucher Specimen No: 12757	Pavazhamalligai/ Harsingar	<i>Sciatica, Skin diseases, Hair tonic.</i>	Shrub/ R	62	0.41	41.61
48	<i>Oroxylum indicum</i> (L.)Vent./ Bignoniaceae/ Voucher Specimen No:11276	Palagapaimani/ Tree of Damocles	100 ml fruit decoction orally given for mouth ulcers.	Tree/ E	58	0.39	38.92
49	<i>Pandanus odorifer</i> (Forssk.) Kuntze/ Pandanaceae/ Voucher Specimen No: 13252	Thazhampoo/ screw-pine	Male flower bracts boiled in water and apply externally for skin diseases	Small Tree/ R	62	0.41	41.61
50	<i>Pentapetes phoenicea</i> L. / Malvaceae/ Voucher Specimen No: 11853	Nagappu/ Noon flower	100 ml boiled Flowers decoction orally given daily twice a day for jaundice.	Herb/ R	48	0.32	32.21
51	<i>Persea macrantha</i> (Ness) Kosterm. / Lauraceae/ Voucher Specimen No:9669	Kolamavu/ Ladder-Wood	Fruit smoke inhaled for relief Asthma pain. Fruit paste apply externally for Rheumatic pain	Tree/ R	68	0.46	45.63

Table 1 List of medicinal plants used for various health issues by rural inhabitant of Wayanad forest division - Kerala, India (Continued...)

S.No	Botanical Name / Family / Voucher Specimen No:	Local Name/ English Name	Parts used & Mode of Application and Use	Habit/ Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
52	<i>Plantago ovata</i> Forssk. /Plantaginaceae/ Voucher Specimen No: 11984	Ispagul / Blond plantain	100ml decoction of seed is orally given 15 days for menstrual disorders.	Tree/ R	72	0.48	48.32
53	<i>Pterocarpus marsupium</i> Roxb. / Fabaceae / Voucher Specimen No: 13231	Vengai/ Malabar Kino Tree	100ml bark decoction used for Diabetic	Tree/ R	66	0.44	44.29
54	<i>Pterocarpus santalinus</i> L.f. / Fabaceae / Voucher Specimen No: 14103	Sivappu Sandhanam/ Red Sanders	Paste of wood powder apply externally for skin diseases.	Tree/ E	58	0.39	38.92
55	<i>Rubia cordifolia</i> L./ Rubiaceae/ Voucher Specimen No:10241	Manjati / Indian madder	50-100 ml Fruit decoction orally given for Anemic and general weakness.	Climbing Shrub/ Rare	66	0.44	44.29
56	<i>Rubus ellipticus</i> Smith./Rosaceae/ Voucher Specimen No:12358	Mullipallam/ Yellow himalayan raspberry	100 ml Fruit juice orally given for cough and sour throat	Climbing Shrub/ R	80	0.54	53.69
57	<i>Ruta graveolens</i> L./ Rutaceae / Voucher Specimen No: 11966	Aruvatham/ Rue	Fresh leaves boiled in coconut oil and externally applied for rheumatic pain.	Herb/ R	94	0.63	63.08
58	<i>Smilax zeylanica</i> L./Liliaceae / Voucher Specimen No: 11952	Kalthamarai/ Genus Smilax	Leaf paste mixed with turmeric powder and externally applied on wounds.	Climber/ S	68	0.45	45.63
59	<i>Spilanthes acmella</i> (L.) R.K. Jansen. / Asteraceae / Voucher Specimen No: 13671	Palvalipoondu/ Toothache plant	Flower head chewed for Tooth ache	Herb/ R	92	0.62	61.74
60	<i>Sterculia guttata</i> Roxb./ Sterculiaceae/ Voucher Specimen No:10409	Kavalam / Spotted Sterculia	Seed oil externally apply for inflammation and, Rheumatic pain.	Tree/ R	80	0.54	53.69

Table 1 List of medicinal plants used for various health issues by rural inhabitant of Wayanad forest division - Kerala, India (Continued...)

S.No	Botanical Name / Family / Voucher Specimen No:	Local Name/ English Name	Parts used & Mode of Application and Use	Habit/ Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
61	<i>Stereospermum chelonoides</i> (L.fil.) DC. / Bignoniaceae/ Voucher Specimen No:10378	Pathiri/ Fragrant Padri Tree	Fruit powder made into smoke and inhaled for asthma.	Tree/ R	68	0.46	45.63
62	<i>Syzygium jambos</i> (L.) Alston- /Myrtaceae/ Voucher Specimen No:10157	Jambou / Rose apple	Fruit eaten as raw for anemia	Tree/ R	62	0.41	41.61
63	<i>Toona ciliata</i> M.Roem./ Meliaceae/ Voucher Specimen No: 12544	Madhakarivambu/ Red cedar	100 ml Equal part of flowers and stem bark decoction orally given for Irregular menstruation.	Tree/ C	60	0.40	40.26
64	<i>Wrightia tinctoria</i> R.Br./ Apocynaceae/ Voucher Specimen No: 11913	Pala/ Sweet indrajao	Leaf soaked in coconut oil and kept in sunlight for 15 days and applied for hair fall and dandruff.	Tree/ C	90	0.60	60.04

C = Cultivation plant, E =Extinct, EN= Endangered, LC= Least Concern, R= Rare, S=Sporadiac

To the best of our knowledge, this is the first quantitative ethnomedicinal study in the study area indicating UV, ICF and FL. The present study records new ethnomedicinal species with their therapeutic uses, which can potentially lead to the development of new therapies and may represent novel bioresources for phytochemical and pharmacological studies. Notably *Amorphophallus sylvaticus* (Roxb.) Kunth. and *Kaempferia galanga* L. have the claim for piles proplems and *Ruta graveolens* L. and also for Joint pain by the healers.

Ailments categories

1. Determatological Infection

- Inflammation
- Skin Diseases
- Antiseptic
- Skin Rashes
- Skin Irritation

2. Dandruff/Hair care

- Hair fall
- Dandruff

3. Wound Healing

- Wound Healing

4. Sexual disorders/Geneto Urinary Ailments

- Increase sperm count
- Menstrual bleedings
- Urinary Irritation
- Sexual depelety/disorders
- Birth control

5. Obesity

- Obesity

6. Circulatory/Cardiovascular diseases

- Anemia
- Heart Diseases

7. Gastro intestinal Ailments

- Stomach Pain
- Stomach Ulcers

Table 2 Informant Consensus Factor (FIC)

S. No.	Aliments Category	No. of uses report	No. of Species used	Informant Constant Factor
1	Determetalogical Infection	519	11	0.98
2	Dandruff / Hair fall	108	2	0.99
3	Wound healing	207	4	1.00
4	Sexual disorders / Genitourinary ailments	765	14	0.98
5	Circulatory/Cardio vascular disease	269	5	0.98
6	Gastro intestinal ailments	101	2	0.99
7	Skeleton-muscular and Neuro system disorders	170	3	0.98
8	Oral and teeth disorders	117	2	0.99
9	Endocrinal disorders	122	2	1.01
10	Respiratory system disorders	456	9	0.98
11	Liver/Jaundice	94	2	1.01
12	Fever/Chronic Fever	624	12	0.98
13	Exocrine disorder	82	1	1.00
14	Piles	122	2	0.99

- c. Indigestion
- d. Constipation
- e. Intestinal Worm
- f. Dysentery

8. Edible and General Health

- a. Piles
- b. Edible food

9. Skeleton - Muscular and Nervous System Disorders

- a. Neuro disease
- b. Paralysis
- c. Joint Pain
- d. Rheumatic Swelling
- e. Rheumatic Pain

10. Oral and Tooth Disorders

- a. Swelling Gum
- b. Toothache
- c. Mouth Ulcers

11. Endocrinal disorders

- a. Diabetic
- b. Kidney stone

12. Respiratory System disorders

- a. Cough and Cold
- b. Asthma
- c. Cough

13. Liver

- a. Jaundice

14. Fever

- a. Chronic Fever

Conflict of Interest

The authors declare no conflict of interest, financial or otherwise.

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