

Quantitative Ethnobotany of Medicinal Plants Used by Indigenous Community in the Munnar Forest Division, Kerala, India

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Article History:

Received on: 03 Apr 2021
Revised on: 07 May 2021
Accepted on: 14 May 2021

Keywords:

Emergency medical technicians (EMTs), Work related injuries, physical violence against healthcare personnel

ABSTRACT

The quantitative ethnobotany deals with the computation of the importance of the plants and vegetation to people. It helps in quantification of qualitative data in the biological and social science. The various quantitative tools in ethnobotany help in the calculation of plant taxon. Ethnobotanical approach provide data which is agreeable to the hypothesis-testing, subsequent statistical validation and comparative analysis. The traditional source of medicinal plants is an important way for daily curative uses in the rural area throughout Kerala. Moreover, among the plant studied habit wise analyzed they are 12 herbs, 13 shrubs, 12 trees and each one of climbing shrub, twining shrub, prostrate shrub, climber. The status of plants are also analyzed and recorded as 26 are common, 14 are rare, 5 are common & Cultivated and 2 are sporadic are described under this study. In this communication, the informations got from the rural inhabitant were compared with the already existing literature. The medicinal plants used by people are arranged alphabetically followed by Botanical name, Family name, Voucher specimen number, Local name, Unani name, Part used, Mode of preparation and Disease cured are discussed. The data were collected randomly from tribal and traditional healers of 85 informants 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.



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eISSN: 2455-8842

DOI: <https://doi.org/10.26452/ijpib.v6i2.1448>



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INTRODUCTION

The quantitative methods were proposed by Philips, led to an increasing awareness for ethnobotanical research. The quantitative ethnobotany deals with the computation of the importance of the plants and vegetation to people. It helps in quantification of qualitative data in the biological and social science. The various quantitative tools in ethnobotany help in the calculation of plant taxon. Ethnobotanical approach provide data which is agreeable to the hypothesis-testing, subsequent statistical validation and comparative analysis. The mys-

tic nature has hidden resources of Biodiversity and use of flowering plants to manage diseases dates back to the beginning of mankind. In ancient periods, man has been on the earth totally depending on green plants for his day to day life needs, especially for healthcare. India is rich in ethnic diversity and traditional knowledge (TK) that has resulted in a considerable body of ethnobotanical research, of which one study has revealed a deep understanding of medicinal plants supported by high consensus. In Kerala, the diversified system of traditional practices prevails among the rural communities since time immemorial. Even though modern medical systems are available, the majority of the people are still depending on the ethnic tradition for curing various diseases. But this valuable oral health information is not yet documented systematically. However, in most of the world countries, especially those in the African continent, Asia and South and Central America, the majority of the population (roughly 80%) still relies to a great extent on herbal medicine for their primary healthcare [1, 2].

India is one of the richest floristic regions of the world and has been a diverse source of plant products and many of these plants species are used for medicinal purposes. The medicinal plants occupy an important position in the social-culture, and therapeutic arena of the India [3]. The tribal and rural population of the India are to a large extent depended on medicinal plants for health care. Traditional knowledge of human health and medicinal has recently become a global concern. The value of medicinal plants and herbs are being lost due to lack of awareness and deforestation. In Kerala, the diversified system of traditional practices prevails among the rural communities since time immemorial. The present study aims to document the plants used by Mudhuvan, Mannan, Malaiaraian and ooralys tribes and the indigenous community/rural people of Munnar Idukki district of Kerala state. Medico-ethnobotany acts as a bridge between botany and tribal knowledge regarding medicinal plants [4].

In every period, every successive century from the development of humankind and advanced civilizations, the healing properties of certain medicinal plants are identified, noted and conveyed to the successive generations. The benefits of one society were passed on to another, which upgraded the old properties, discovered new ones, till present days. Consequently, historical texts from medical traditions in various countries of the world such as India, China, Egypt, Greek, Roman and Syria bring new insight into plant usage and become established as a rewarding tool for ethnopharmacologi-

cal research. In India a number of studies have been in use, under indigenous systems of medicine like Ayurveda, Sidha and Unani. Ayurvedic texts viz., Charak Samhita, Sushrut Samhita, Sarangadhara Samhita, Bhavaprakasha Samhita, Satmya Darpan Samhita, Vaisajya Ratnabali, *Rasatarangini*, etc., explain numerous remedies to treat different ailments. Indeed, many plant based medicines are still in demand for a variety of diseases like congestive cardiac failure, bronchitis, inflammatory conditions and other.

Kerala is the state on the southern western malabar coast of India. Spread over 38.863 km². Kerala is the twenty-first largest Indian state by area. It is bordered by Karnataka to the north and northeast, Tamil Nadu to the east and south, and the Lakshadweep sea to the west. Malayalam is the most widely spoken language and is also the official language of the state. Kerala is a homeland of a number of tribal communities. Majority of them inhabit the western slope of the Western Ghats. Thirty-six communities are listed in the scheduled tribes list of the State and their population according to 1991 census. Among them the Mudhuvan, Mannan, Malaiaraian and Ooralys tribes well knowledgeable in the use of medicinal plants for day to day life and healthcare in Idukki district.

Objective of this study was to interact with local traditional healers, tribals and document their knowledge on medicinal uses of plants. To collect scientific information and identify the medicinal plants used by the tribal and rural people of the study area. 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 Mudhuvan, Mannan, Malaiaraian and Ooralys tribal and rural people of Munnar forest division, Idukki district of Western Ghats of Kerala. To provide status and conservation strategies of the plant in order to conserve the plants which are endangered, rare and common in the study area. In kerala ethnomedicinal value of plants in possession of various tribals and rural communities for treating various diseases and disorders has been done to some extent [5-7]. A perusal of these reports suggested that the ethnobotanical survey in Munnar forest division, Idukki district of Western Ghats of Kerala is incomplete and traditional herbal healing knowledge of a large number of folk communities need documentation. There is no previous report in the records of ethnobotanical knowledge of herbal healing for various diseases from Mudhuvan, Mannan, Malaiaraian and Ooralys tribals of Munnar forest division of Iduki

district, Kerala. Therefore, the current investigation aims to identify, collect and document the medicinal plants traditionally used for the treatment of various disorders in Munnar forest division. Documentation of traditional ethnomedicinal knowledge, indigenous herbal preparation for various ailments could help in preserving knowledge and creating awareness regarding the need for conservation of biological resources.

Present Knowledge on Local Folk Medicine

Ethnobotanical knowledge has been documented from various [8, 9] parts of Indian sub-continent [10, 11]. In Kerala state, ethnomedicinal value of plants in possession of various tribal [12, 13] and rural folk communities for treating various diseases have been done to some extent [14, 15]. A perusal of the literature reveals that several ethnobotanical studies among various tribals have been reported from the various district of this state except these predominant Mudhuvan, Mannan, Malaiaraian and Ooralys tribes in Munnar forest division, Idukki district, which has not yet been studied from ethnobotanical point of view.

Idukki District

Idukki district is located in the middle part of Kerala in the Idukki District. It is bounded on the East by Madurai District of Tamil Nadu, on the West by Ernakulam and Kottayam Districts of Kerala, on the South by Pathanamthitta District and on the North by Trichur and Coimbatore Districts of Kerala and Tamil Nadu States respectively.

It lies between 9° 15' and 10° 21' of North latitude and 76° 37' and 77° 25' of East longitudes with an area of 5,087 sq. km. Idukki ranks first among the districts in the state in respect of area and forming 13 percent of the total area of the state. It extends by 115km. from South to North and 67 km from East to West.

Munnar Forest Division

As far as the Munnar forest Division are concern, it is located in the middle part of Kerala in Idukki District. It consists of four forest ranges such as Mannar, Devikulam, Adimaly and Neriya Mangalam ranges. The forest areas such as Lakshmi, Rajamalai in Munnar range, ODK, Top station, Silent valley, Poopara and Bodimettu forest areas in Devikulam range, Choorakota, Chinnapara, Thumbipara forest areas in Adimaly Range and Inchapara, Muduvanpara, Mamalaikandam, Valera and audit 4 Mannium forest areas in Neriya Mangalam Range are the demarcated areas of rich floristic diversity. Due to altitudinal variations there is remarkable changes and difference in the climate within this tract.

Climate and Vegetation

Major area of the division falls in the Western slope of the Western Ghats. This area receives rains, from both monsoons viz., the Southwest and Northeast and showers during April – May. The annual average rainfall is about 3000 mm. The regular monsoon commences by June and lasts till the end of August. The climate is more or less temperate in the high altitude areas and the temperature varies from 6° C to 26° C.

Tribal Areas

There are different tribal communities namely Mudhuvan, Mannan, Malaiaraian and Ooralys are settled in different parts of the district. Among them some of them are Elampilacheri, Mamalaikandam and olavanthodu in Valera forest station, Choorakota, Chinnapara, and Thumbipara tribal colonies in Machipulav forest station and Sandoz tribal colony in Munnar ranges. The survey team interacted with the tribal and local peoples and collected useful information on the folk medicinal plants with the cooperation of forest department officials of Munnar forest division.

Agricultural Crops

The agricultural crops like Coffee, Tea, Pepper, Coconut, Cardamom, Ginger, Plantain and Paddy etc., are the major agricultural crops found throughout the district. The soil and climate of the Munnar district is very suitable for agricultural crops and it promotes luxuriant growth of the vegetation.

METHODOLOGY

The study was conducted during 2015 (25 days) from 16th November 2015 to 10th December 2015 by the research team of Survey of medicinal plants unit, Regional Research Institute of Unani Medicine under the CCRUM (Ministry of AYUSH) New Delhi, to collect information on medicinal plants used by traditional healers in the Munnar forest division, Idukki district of Western Ghats of Kerala (Figure 1). The ethnomedicinal information was gathered from the indigenous people of the study area called Mudhuvan, Mannan, Malaiaraian and Ooralys. They are oldest groups of the branch of ethnic people in South India. They reside in remote and inaccessible forest areas and practice indigenous phytotherapy to treat common ailments. During the course of exploration of ethnomedicinal plants information has been gathered from the healers inhabiting the forest areas who have sound knowledge of herbal remedies. For many decades, the tribal community has a traditionally self-managed system of folk medicine and primary healthcare mainly based on herbal remedies.

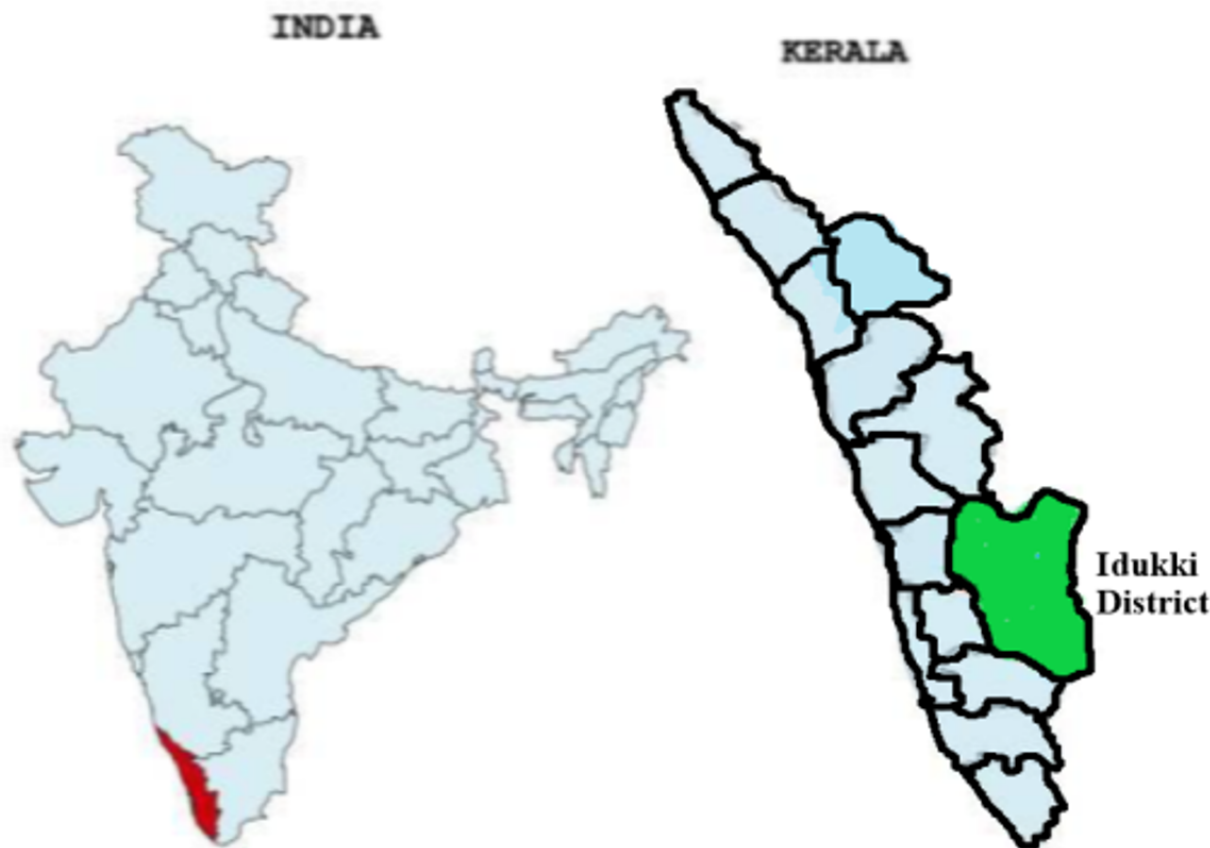


Figure 1: Map of the Study Area

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.

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 got from the tribals was recorded in field notebooks, ethnobotanical data collecting proforma sheet and compared with

the previously reported literatures [5, 16, 17]. The collected medicinal plants species were identified by the local people with their vernacular names, photographed and sample specimens were collected for the preparation of herbarium. The Flora of Presidency of Madras [18] and The Flora of Tamil Nadu Carnatic [19] were used to ascertain the nomenclature. The voucher specimens were deposited in the herbarium at Regional Research Institute of Unani Medicine, Chennai.

Statistical Analysis (Quantitative analysis)

Use Value (UV)

The relative importance of each plant species known locally to be used as herbal remedy is reported as use value (UV) and it was calculated using the following formula [20].

$$UV = \frac{\sum U}{n}$$

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.

Factor Informant Consensus (FIC)

The ICF was used to analyse the agreement degree

Table 1: Quantitative Ethnobotany of Medicinal Plants Used by Indigenous Community in the Munnar Forest Division, Kerala, India

S.No	Botanical Name / Family	Local Name	Parts used	Mode of Application and Use	Habit	Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
1.	<i>Achyranthus aspera</i> L./ Amaranthaceae / (RRIUM, CH-11980)	Nayaruvi	Leaf	Leaf paste mixed with Neem oil and small quantity of turmeric powder is externally applied on wounds.	Tree	C	72	0.85	88.24
2.	<i>Aerva lanata</i> Juss. / Amaranthaceae / (RRIUM, CH-11885)	Serupala	Leaf	100ml of dried leaf decoction is orally given for kidney stone.	Herb	C	76	0.89	89.41
3.	<i>Alstonia scholaris</i> (L.) R. Br./ Apocynaceae/ (RRIUM, CH-11866)	Eazilaipalai	Latex	Latex externally applied on swelling and pain.	Tree	C	68	0.80	80.00
4.	<i>Alstonia venenata</i> R.Br./ Apocynaceae/ (RRIUM, CH-11908)	Palamunpala	Latex	Latex externally applied on wounds.	Shrub	R	56	0.66	65.88

Continued on next page

Table 1 continued

S.No	Botanical Name / Family	Local Name	Parts used	Mode of Application and Use	Habit	Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
5.	<i>Amaranthus spinosus</i> L./ Amaranthaceae/ (RRIUM, CH-11949)	Mulluk-eerai	Leaf	50ml of leaf extract is boiled in 100ml coconut oil and externally applied on burning injuries.	Herb	C	54	0.64	63.52
6.	<i>Andrographis alata</i> (Vahl) Nees / Acanthaceae/ (RRIUJM, CH-11868)	Nilakang-iram	Leaf	100ml leaf extract orally given with honey for asthma.	Herb	R	70	0.82	82.35
7.	<i>Artemisia nilagirica</i> (Clarke) Pamp. /Asteraceae/ (RRIUM, CH-11887)	Pachaikar-puram	Leaf	100ml leaf extract boiled with 100ml of coconut oil is externally applied for muscular pain.	Shrub	C	52	0.61	61.17
8.	<i>Asparagus racemosus</i> Wild. /Liliaceae/ (RRIUM, CH-11857)	Satavari	Root tuber	100ml root decoction is orally given for stomach ulcers.	Shrub	R	60	0.70	70.59

Continued on next page

Table 1 continued

S.No	Botanical Name / Family	Local Name	Parts used	Mode of Application and Use	Habit	Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
9.	<i>Biophytum sensitivum</i> (L.) DC. / Oxalidaceae / (RRIUM, CH-11282)	Nilapushpam	Leaf	Equal part of leaf and coconut oil together and externally applied on inflammation.	Herb	R	48	0.56	56.47
10.	<i>Calotropis gigantea</i> (L.) R.Br. / Asclepiadaceae / (RRIUM, CH-11833)	Erukan	Leaf, Latex	Leaf smoke inhaled for Asthma and Latex externally applied on wounds.	Shrub	C	52	0.61	61.18
11.	<i>Cassia alata</i> L. / Caesalpiniaceae / (RRIUM, CH-11848)	Vanthakara	Leaf	Leaf paste mixed with turmeric and externally applied on ringworm.	Shrub	C	48	0.56	56.47
12.	<i>Cassia occidentalis</i> L. / Caesalpiniaceae / (RRIUM, CH-11817)	Pothagarai	Leaf	Leaf paste mixed with turmeric paste and externally applied on Scabies.	Shrub	C	50	0.59	58.82

Continued on next page

Table 1 continued

S.No	Botanical Name / Family	Local Name	Parts used	Mode of Application and Use	Habit	Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
13.	<i>Catharanthus roseus</i> (L.) G.Don./ Apocynaceae / (RRIUM, CH-11892)	Nithiyakal- yani	Leaf	1.30-40 ml leaf extract is orally given for intestinal ulcers. 2. Leaf paste externally applied on wounds.	Herb	C	54	0.63	63.52
14.	<i>Coccinia grandis</i> (L.) Voigt. / Cucurbitaceae/ (RRIUM, CH-11894)	Kovalam	Fruit	100ml fruit juice is orally given for diabetics.	Climbing Shrub	C	48	0.56	56.47
15.	<i>Coffea arabica</i> L./ Rubiaceae / (RRIUM, CH-11819)	Coffee	Seed	Decoction of seed powder mixed with sugar is orally given as stimulant.	Shrub	C & C	80	0.94	94.11
16.	<i>Costus speciosus</i> (Koen.) J.E. Smith / Costaceae/ (RRIUM, CH-11913)	Kostum	Leaf	100ml decoction of leaf is orally given twice daily for menstrual disorders.	Herb	C	70	0.82	82.35

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Table 1 continued

S.No	Botanical Name / Family	Local Name	Parts used	Mode of Application and Use	Habit	Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
17.	<i>Croton tiglium</i> L./ Euphorbiaceae / (RRIUM, CH-11940)	Nervaalam	Fruit	5-10 fruits soaked in 100ml of coconut oil for 15 days and externally applied on skin disease.	Tree	R	68	0.80	80.00
18.	<i>Curcuma aromatica</i> Salisb. / Zingiberaceae/ (RRIUM, CH-11846)	Kasturimanjal	Rhizome	Rhizome made into paste with cow milk and externally applied on face for dark patches.	Herb	R	72	0.84	84.70
19.	<i>Curcuma longa</i> L./Zingiberaceae / (RRIUM, CH-11816)	Manjal	Rhizome	Rhizome paste externally applied on swelling and foot crack.	Herb	C & C	66	0.77	77.66
20.	<i>Cuscuta reflexa</i> Roxb. /Cuscutaceae / (RRIUM, CH-11906)	Ottuchedi	Whole plant	100ml fresh juice orally given for jaundice in early morning empty stomach.	Leaf	C	48	0.56	56.47

Continued on next page

Table 1 continued

S.No	Botanical Name / Family	Local Name	Parts used	Mode of Application and Use	Habit	Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
21.	<i>Eucalyptus globules</i> Labill. / Myrtaceae / (RRIUM, CH-11999)	Karpoora-maram	Leaf	Leaves boiled in water, the water is used for bath and applied swelling area for muscular pain.	Tree	C	62	0.73	72.94
22.	<i>Euphorbia hirta</i> L./ Euphorbiaceae / (RRIUM, CH-11900)	Amman-pachai	Latex	Latex externally applied for wounds to remove thorn in body.	Herb	C	56	0.66	65.88
23.	<i>Helicteres isora</i> L./ Sterculiaceae / (RRIUM, CH-11822)	Edampuri-valampuri, Narae	Fruit	Fruit soaked in coconut oil for 20 days and applied on hair for hair falling.	Tree	R	72	0.85	84.70
24.	<i>Hemidesmus indicus</i> (L.) R.Br. / Periplocaceae / (RRIUM, CH-11853)	Nannari	Root	100ml decoction of root power orally given for 7 days in early morning for jaundice.	Twining Shrub	C	78	0.92	91.76

Continued on next page

Table 1 continued

S.No	Botanical Name / Family	Local Name	Parts used	Mode of Application and Use	Habit	Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
25.	<i>Hibiscus rosa-sinensis</i> L./ Malvaceae/ (RRIUM, CH-11902)	Semparuthi	Leaf, Flowers	Dried leaf and flowers soaked in coconut oil and applied on hairs for hair fall.	Shrub	C	76	0.89	89.41
26.	<i>Hydnocarpus wightiana</i> Bl / Flacourtiaceae/ (RRIUM, CH-11865)	Maravetti	Seed, Bark	1. Seed oil externally applied for rheumatic pain. 2. Bark powder used as shampoo for dandruff.	Tree	R	52	0.61	61.18
27.	<i>Kaempferia galanga</i> L. / Zingiberaceae/ (RRIUM, CH-11939)	Kacholam	Rhizome	10-15gm of rhizome powder is orally given with hot water for bleeding piles.	Herb	R	58	0.68	68.23
28.	<i>Mimosa pudica</i> L./ Mimosaceae / (RRIUM, CH-11827)	Thottalvedi	Leaf	Leaf paste and turmeric powder are mixed with coconut oil and externally applied on Scabies.	Herb	C	46	0.54	54.11

Continued on next page

Table 1 continued

S.No	Botanical Name / Family	Local Name	Parts used	Mode of Application and Use	Habit	Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
29.	<i>Myristica fragrans</i> Houtt. / Myristicaceae / (RRIUM, CH-11879)	Jadikaii	Mace	10gm mace powder orally given with hot water for stomach pain and flatulence.	Tree	C & C	54	0.64	63.52
30.	<i>Ocimum purpurascens</i> Benth. / Lamiaceae / (RRIUM, CH-11884)	Thiruner-tupachai	Leaves	50ml leaf extract boiled with 100ml of water and orally given for cough.	Herb	C	62	0.73	72.94
31.	<i>Piper longum</i> L. / Piperaceae / (RRIUM, CH-11856)	Thipili	Fruit	Fruit paste mixed coconut oil and externally applied for muscular pain.	Herb	R	72	0.85	84.70
32.	<i>Piper nigrum</i> L. / Piperaceae / (RRIUM, CH-11823)	Milaghu	Fruit	Fruit powder made into paste with honey and orally given for dry cough.	Shrub	C & C	78	0.92	91.76

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Table 1 continued

S.No	Botanical Name / Family	Local Name	Parts used	Mode of Application and Use	Habit	Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
33.	<i>Plantago ovata</i> Forssk. /Plantaginaceae/ (RRIUM, CH-11984)	Ispagul	Seed	100ml decoction of seed is orally given 15 days for menstrual disorders.	Tree	R	60	0.71	70.58
34.	<i>Plumbago zeylanica</i> L./ Plumbaginaceae/ (RRIUM, CH-11963)	Kidivelam	Leaf	50ml leaf extract boiled in 100ml coconut oil and externally applied on leprosy.	Shrub		56	0.66	65.88
35.	<i>Ricinus communis</i> L./ Euphorbiaceae/ (RRIUM, Ch-11872)	Amanaku	Leaf	100ml leaves juice mixed with 5gm ginger powder is 7 days orally given twice daily for jaundice.	Shrub	C	42	0.49	49.42
36.	<i>Ruta graveolens</i> L./ Rutaceae / (RRIUM, CH-11966)	Aruvatham	Leaf	Fresh leaves boiled in coconut oil and externally applied for rheumatic pain.	Herb	R	72	0.85	84.70

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Table 1 continued

S.No	Botanical Name / Family	Local Name	Parts used	Mode of Application and Use	Habit	Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
37.	<i>Scoparia dulcis</i> L./ Scrophulariaceae/ (RRIUM, CH-11832)	Kaluluki	Whole plant,	50-100ml plant decoction orally given 3 days twice daily for viral fever.	Herb	C	38	0.66	44.78
38.	<i>Sida rhombifolia</i> L./ Malvaceae / (RRIUM, CH-11825)	Kurunthotti	Leaf	Leaf paste mixed with turmeric and externally applied on wounds and swellings.	Herb	C	66	0.78	77.65
39.	<i>Smilax zeylanica</i> L./ Liliaceae / (RRIUM, CH-11952)	Kalthamarai	Leaf	Leaf paste mixed with turmeric powder and externally applied on wounds.	Climber		70	0.82	82.35
40.	<i>Solanum nigrum</i> L. / Solanaceae / (RRIUM, CH-11930)	Manithakali	Flower, Fruit	100ml decoction of fruit and flower is orally given 7 days for jaundice.	Herb	C	72	0.85	84.71

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Table 1 continued

S.No	Botanical Name / Family	Local Name	Parts used	Mode of Application and Use	Habit	Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
41.	<i>Solanum torvum</i> Sw./ Solanaceae / (RRIUM, CH-11835)	Sundai	Fruit	50-100ml fruit decoction is orally given for stomach pain.	Shrub	C	54	0.64	63.52
42.	<i>Syzigium aromaticum</i> (L.) Merr. & Perry / Lauraceae / (RRIUM, CH-11888)	Kurumbu	Leaf, Fruit	Fruit and leaf paste kept upon aching tooth for toothache.	Tree	R	48	0.56	56.47
43.	<i>Tabernaemontana divericata</i> (L.) R.Br. ex & Schults / Apocynaceae / (RRIUM, CH-11839)	Nandiya-vattam	Flower	Flower soaked in coconut oil and externally applied for skin disease.	Shrub	C	42	0.49	49.41
44.	<i>Tabernaemontana heyneana</i> Wall. / Apocynaceae / (RRIUM, CH-11844)	Kundala-Palai	Leaf	Leaves soaked in coconut oil and all overs to keep in sun light for 10 days and the oil is externally applied for skin diseases.	Tree	R	34	0.40	40.00

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Table 1 continued

S.No	Botanical Name / Family	Local Name	Parts used	Mode of Application and Use	Habit	Status	No. of Users	Use Value (UV)	Fidelity Level (FL) %
45.	<i>Thespesia populnea</i> (L.) Soland. ex Correa / Malvaceae/ (RRIUM, CH-11874)	Poovarasam	Fruit	Fruit paste externally applied on dark spots.	Tree	C	48	0.56	56.47
46.	<i>Wrightia tinctoria</i> R.Br./ Apocynaceae/ (RRIUM, CH-11913)	Pala	Leaf	Leaf soaked in coconut oil and kept in sunlight for 15 days and applied on hair fall and dandruff.	Tree	C	68	0.80	80.00
47.	<i>Zingiber officinale</i> Rose. /Zingiberaceae/ (RRIUM, CH-11847)	Ingee	Rhizome	Rhizome extract mixed with honey is orally given for throat pain.	Herb	C&C	70	0.82	82.35

of ailments [21, 22]. 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.

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 [23–25]. The FL was calculated using the following formula:

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

where Np 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.

RESULT AND DISCUSSION

Western Ghats of Munnar forest division has a variety of medicinal plants which are used by tribes and traditional healers for their primary health care. It consists of four forest ranges such as Mannar, Devikulam, Adimaly and Neriya mangalam ranges. The forest areas such as Lakshmi, Rajamalai in Munnar range, ODK, Top station, Silent valley, Poopara and Bodimettu forest areas in Devikulam range, Choorakota, Chinnapara, Thumbipara forest areas in Adimaly Range and Inchapara, Muduvanpara, Mamalaikandam, Valera and audit 4 Mannium forest areas in Neriya mangalam range are the demarcated areas of rich floristic diversity. Due to altitudinal variations there is remarkable changes and difference in the climate within this tract.

The present study identified tribal healers using 47 species of ethnomedicinal wild Plants distributed in 41 genera belonging to 29 families to treat various diseases such as dry cough, menstrual disorders, piles, viral fever, kidney stone, joint pain, jaundice, skin diseases, contraceptive purpose, etc. The result of the survey presented in Table 1, in which the plants are arranged alphabetically by botanical names for each species. The following ethnobotanical information were provided; Botanical names, Voucher specimen numbers, Family name, Local names, Part used, Mode of Application and Ethnobotanical Uses, Habit, Status of plant according to the informations collected. Moreover life forms of medicinally used plants are analyzed. They are 18 herbs, 13 shrubs, 12 trees and each one in Climbing

shrub, Twining shrub, Climber, Parasitic shrub are recorded and statuses of plants are 26 in commonly available 14 are rare, Five are Common & cultivated and two is sporadic in the study area.

Among the studied 47 species various parts are used to cure various ailments in the different methods of formulations they are leaves used in 23 different formulations, fruits used in 9 different formulations, latex and rhizomes are used in each 4 different formulations, seed and flowers are used in 3 different formulations and whole plant, root, root tubers, stem bark & mace used each one in separate formulations. Moreover among the studied species their mode of application are analyzed they are 30 applications are externally and 18 applications are internally used by the tribes in the study area.

This is consistent with other general observations which have been reported earlier in relation to medicinal plants studies by the Indian system of medicines like Siddha, Ayurveda and Unani [26–28]. Different types of preparation made from medicinally important plants include decoction, juice, powder, paste, oil and plant extract. Drugs are prescribed either single or in a combination of more than one plant/parts of same or different plants to the people suffering from various diseases.

The study of ethnomedicinal system and herbal medicinal as therapeutic agent is a paramount importance in addressing health problems of traditional communities and third world countries as well as industrialized societies. Previous reports on the ethnobotany of different district in Kerala, and adjoining areas provide evidence for the presence of numerous ethnomedicinal plants used by various tribal communities [12, 29]. But, so far no systematic ethnobotanical survey has been made in this area, except the documentation of medicinal plants used by the tribes like Mudhuvan, Mannan, Malaiaraian and ooralys tribes. The therapeutic uses of herbal drugs and drug preparations differ from one region to the other. For example, people in different villages in India, exclusively used *Andrographis alata* (Vahl) for snake bite, scorpion and centipede bite and heavy fever like malaria and typhoid, Anti-inflammatory [30, 31]. However, the Mudhuvan, Mannan, Malaiaraian and Ooralys tribes of Munnar, Idukki district of Kerala state are used *Andrographis alata* (Vahl) Ness to treat Asthma. The traditional knowledge about utilization of local plant species is vital in alternate health care system as well as for the self-sustenance of local population. High costs coupled with numerous side effects of synthetic drugs are forcing people to depend on the locally available herbal medicine for their health care needs.

Table 2: Medicinal Uses

Sl.No	Medicinal Uses	No of use report	No of species used	Informant Constant Factor (ICF)
1	Dermatological Infection	522	10	0.98
2	Edible & General health	80	01	1.00
3	Endocrine disorders	48	01	1.00
4	Fever & Chronic Fever	38	01	1.00
5	Gastroenteritis	222	04	0.99
6	Hair fall & Dandruff	268	04	0.98
7	Jaundice & Liver disorder	240	04	0.98
8	Piles	58	01	1.00
9	Respiratory disorders	210	03	0.99
10	Sexual disorders & genitors' Urinary disorder	206	03	0.99
11	Skeletomuscular swelling pain & Nervous system	378	06	0.98
12	Toothache & oral disorder	118	02	0.99
13	Wound healing	548	09	0.98

In the present study statically analysed the 47 plants species used by 85 informants as ethnomedicines and the data were collected in the study area. The commonly used plant species was *Coffea arabica* L. (Rubiaceae) seeds popularly known as coffee with highest UV of 0.94 by 80 informants it is used for refreshment as decoction. Followed by *Hemidesmus indicus* (L.) R.Br. (Periplocaceae) and *Piper nigrum* L. (Piperaceae) With UV of 0.92 by 78 informants which is used for Jaundice as decoction and Dry cough as paste with honey. The species with lowest Use Value was observed, followed by *Tabernaemontana heyneana* Wall. (Apocynaceae) with UV of 0.40 by 34 informants as soaked oil extract for skin diseases, *Scoparia dulcis* L. (Scrophulariaceae) with UV of 0.66 by 38 informant as decoction for viral fever, *Tabernaemontana divericata* (L.) R.Br. ex & Schults (Apocynaceae) and *Ricinus communis* L. (Euphorbiaceae) with UV of 0.49 by 42 informants which is used as flower soaked oil for skin diseases and juice for Jaundice was analyzed (Table 1).

In order to analyze the general usage pattern of plants, the informants 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 31 diseases divided as 12 ailments categories among them highest value was observed in edible and general health, endocrinal disorders and fever/chronic fever as Fic value:1.00 at same the Lowest value was observed in determetalological infection, liver disor-

ders, hair fall & dandruff and wound healing as Fic value: 0.98 (Table 2).

Thereafter Fidelity level (FL) is useful for identifying the most preferred species used by informants for treating certain ailments of the reported fruit species. The highest fidelity level of 100% most of which were used in single ailments by the informants. The plant with highest Fidelity level was *Coffea arabica* L. (Rubiaceae) (94.11%), Followed by *Hemidesmus indicus* (L.) R.Br. (Periplocaceae) and *Piper nigrum* L. (Piperaceae) (91.76%) analysed. At the same, the lowest Fidelity level are observed in rarely used less known plant species like *Tabernaemontana heyneana* Wall. (Apocynaceae) (40.00%), *Scoparia dulcis* L. (Scrophulariaceae) (44.078%), *Ricinus communis* L. (Euphorbiaceae) (49.41%) and *Tabernaemontana divericata* (L.) R.Br. ex & Schults (Apocynaceae) (49.41%) values are observed. The same analysis were correlated and observed studied by [32] in the wild tuberous species used by tribals in Koraput District of Odisha, India [33] diversity and use of palms in Zahamena, Eastern Madagascar.

This is consistent with other general observations which have been reported earlier in relation to wild medicinal plants studies by the Indian system of medicines like Siddha, Ayurvedha and Unani [26–28]. Different types of preparation made from medicinally important plants include decoction, juice, powder, paste, oil and plant extract. Drugs are prescribed either single or in a combination of more than one plant/parts of same or different plants to the people suffering from various diseases. In the Western Ghats of Munnar forest divi-

sion, Kerala the local herbal healers and elder people rich in traditional knowledge depend on the natural resources of the area. Most of them still consider traditional herbal knowledge as traditional secrets. But through repeated contacts, and discussions, they shared their traditional herbal knowledge. The wild medicinal plants play an important role in providing knowledge to the researchers in the field of ethnobotany, ethnopharmacology and nutritional studies. The observation of present study shows that traditionally used wild medicinal plants plays a significant role in the life of tribal people.

Ailments Categories

1. Dermatological Infection

1. Inflammation
2. Skin Diseases
3. Leprosy
4. Dark Spot
5. Ring Worm

2. Edible and General Health

1. Bleeding Piles
2. Edible food (Stimulant)

3. Endocrinal Disorders

1. Diabetic

4. Fever

1. Viral Fever

5. Gastrointestinal Ailments

1. Stomach Pain
2. Stomach Ulcers
3. Indigestion
4. Constipation
5. Intestinal Ulcer
6. Flatulence

6. Haircare/Dandruff

1. Hair fall
2. Dandruff

7. Liver

1. Jaundice

8. Respiratory System Disorders

1. Cough and Cold
2. Asthma
3. Cough

9. Sexual Disorders/Genito Urinary Ailments

1. Menstrual bleedings
2. Kidney Stone

10. Skeleton - Muscular and Nervous System Disorders

1. Neuro disease
2. Paralysis
3. Joint Pain
4. Rheumatic Pain

11. Oral and Tooth Disorders

1. Toothache

12. Wound Healing

1. Wound Healing
2. Burning injuries
3. Foot Crack

CONCLUSION

The present study showed that traditional treatment 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. 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 *Helicteres isora* L. for hair fall, *Hemidesmus indicus* (L.) R.Br. for Diabetic and *Andrographis alata* (Vahl) Nees., for asthma are claimed from the indigenous communities in the study area.

ACKNOWLEDGEMENT

The authors are grateful to The Director General, Central Council for Research in Unani Medicine (CCRUM), New Delhi for providing necessary facilities, and financial sanctions to conduct the study and Deputy Director, Regional Research Institute of Unani Medicine, Chennai, for providing fund and other facilities. I also sincerely express my thanks to Principal Chief Conservator of Forest, Kerala State. I extend my thanks to District Forest officers, Munnar Forest Division, Forest Range Officers, Foresters, Forest Guards and Forest Watchers of concern forest ranges of Munnar forest division for providing necessary guidelines and assistants in the forest areas during the survey tour programmes. I also thankful to tribal's and rural inhabitants for given valuable medicinal uses of Plants.

Ethics Statement

The study was carried out in accordance with the recommendations of the Code of Ethics of the International Society of Ethnobiology. Ethics approval was not required by the Institutional Ethical Committee. Verbal informed consent was obtained from each informant prior to all interviews. During this discussion, the research objectives, interview procedure were explained to each informant and confidentiality was assured. Consent for photos was also taken and kept in the Herbarium of Survey of Medicinal Plants Unit, Regional Research Institute of Unani Medicine, No. 1, West Madha Church Road, Royapuram, Chennai-13.

Funding Support

The authors declare that they have no funding support for this study.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Cite this article: Venkatesan K, Murugeswaran R, Mokhtar Alam, Ram Pradap Meena, Pawan Kumar, Mohamed Aslam, Zaheer Ahmed N. **Quantitative Ethnobotany of Medicinal Plants Used by Indigenous Community in the Munnar Forest Division, Kerala, India.** Int. J Pharm. Int. Biosci. 2021; 6(2): 21-41.

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