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Ethnomedicinal flowering plants used by Kurumas, Kurichiyas and Paniyas tribes of Wayanad District of Kerala, India

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Abstract
Documentation of indigenous knowledge through botanical studies is very important for the conservation and utilization of biological resources. The present study aims to document the traditional knowledge of medicinal plants used by the indigenous tribes-Kurichiyas, Kurumas, and Paniyas residing in the pockets of Wayanad district of Kerala. Ethnobotanical information was collected using primary as well as secondary sources of data. The study noticed that the above-mentioned tribes use 114 medicinal flowering plant species belonging to 47 families., among them, 39 are herbs, 28 are shrubs, 26 are trees and remaining 21 are climbers. The difference in usage of plants by same tribes occupying different localities and different tribes of the same or nearby localities was observed. The study also revealed that the Kurichiya community possesses high ethnobotanical knowledge when compared to the other two communities. Ethnomedicinal studies supplemented with global information have great significance in the collection of traditional knowledge, preparation of recorded data and in the conservation of endangered medicinal plant species.

Keywords: western ghats, ethnic groups, ethnomedicine, traditional knowledge

Introduction
The mystic 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. Wayanad district is with a hilly terrain on the southern Western Ghats and located in the northeast part of Kerala state in India. The district is unique for its rich wealth of flora and diverse ethnic cultures. The district has the highest concentration of tribals in Kerala. They form 17.1% of the total population of the district. The ethnic diversity of the district is very impressive as evidenced by ten different tribal groups/communities. Some of them are Paniyas, Adiyas, Kattunayakans, Kurichiyans, Kurumas, Uralis, and Uraali Kurumas *etc*. Among them, the three dominant tribal groups are Mullukuruma or Kuruma, Paniya, and Kurichiyans. These are the communities which still hold knowledge on biodiversity. Though Wayanad district is blessed with lots of natural beauty and vegetation, the studies related to ethical knowledge on medical plants occurred here are very less [1-5]. In this context, the present study was undertaken with an objective to understand the ethnic knowledge about flowering medicinal plants used by different tribal groups of Wayanad district.

Materials and Methods
Study area
Wayanad district is situated in the Western Ghats region of Kerala with an altitude varying from 700 to 2100 m sea level. Nilgiri and Mysore district of Tamil Nadu and Karnataka respectively bound it on the East, Coorg district of Karnataka on the North, Malappuram district of Kerala on the South and Kozhikode and Kannur district of Kerala on the West. Wayanad lies between 11°27'N and 15°58'N latitude and 75°47'E and 70°27'E longitude. Extensive field visits were conducted to selected panchayaths and tribal colonies of the district which include Noolpuzha panchayath Kumulpura Kurumas colony, Mundupara Paniyas colony and Huruchiya Kurichiya colony of Thirunelli and Idiyamvayal panchayaths.

Ethnobotanical survey
Ethnobotanical data were collected according to the methodology suggested by Jain and Goel [6]. The ethnobotanical data were collected using a standard questionnaire through interviews and discussions with the help of Vaidyas and elder citizen. Plant species were identified with the help of Flora of the Presidency of Madras [7] and Flowering plants of Kerala [8]. Medicinal flowering plants were used by Kurichiya, Kuruma and Paniya tribes to treat various diseases are listed in Table 1. The plant species are arranged in alphabetical order of their botanical names, followed by their family, vernacular name, habit, parts used and a brief note on their Ethnomedicinal uses.

Table 1: List of medicinal plants collected from the different tribes and their uses in Wayanad district, Kerala

Botanical name	Local name	*Habit	Family	Parts used	Therapeutic use	*Tribes associated
Abutilon hirsutum G. Don.	Oorakam	Shrub	Malvaceae	Whole plant	Used in treating piles and symptoms of tuberculosis. Root is grinded and used for tooth ache	Ku
Achyranthes aspera L.	Kadaladi	Herb	Amaranthaceae	Whole plant	The decoction of whole plant is used to bath children suffering from fever. Root paste is applied on forehead for headache.	Ku
Acorus calamus L.	Vayambu	Herb	Araceae	Rhizome	Rhizome paste is taken internally for worm infection and abdominal pain.	Ku Km
Adhatoda justicia L.	Aadalodakam	Shrub	Acanthaceae	Whole plant	Leaves decoction is used in the treatment of cold and cough. It helps to control internal and external bleeding such as bleeding gums.	Pa Ku
Aegle marmelos Corr.	Koovalam	Tree	Rutaceae	Root Bark Leaf Fruit	Leaf juice is used for constipation. Dried powder of fruit and seed is used for chronic dysentery.	Ku Km
Aerva lanata (L.) Juss. ex Shult.	Cherula	Herb	Amaranthaceae	Whole plant	Whole plant extract is used for stomach ache.	All
Aglaia lawii Wight	Vella akil	Tree	Meliaceae	Bark	Anticancerous and medicine for rheumatism.	Ku Km
Aloe vera L.	Kattarvazha	Herb	Liliaceae	Leaf	Leaf pulp is used for preparation of oil for dandruff.	All
Alpinia calcarata Rosc.	Chitaratha	Herb	Zingiberaceae	Tuber	The root of the plant is used to cure fever.	Ku
Alstonia venenata R. Br.	Analivega	Tree	Apocyanaceae	Root Fruit	Useful for skin diseases. Used against bites of venomous snake bites like cobra, viper.	Ku
Andrographis paniculata Nees.	Kiriath	Herb	Acanthaceae	Whole plant	Leaf juice is used for treatment of liver diseases.	Km
Annona muricata L.	Mullatha	Tree	Annonaceae	Whole plant	The plant is mainly used against cancer. Fruit is used for arthritic pain, fever, malaria, elevate mother's milk after childbirth.	Pa
Aporosa lindleyana Baill.	Vetti	Tree	Euphorbiaceae	Bark	Root bark is boiled in water and the decoction is used for jaundice.	All
Argyreia speciosa Sweet.	Samudrapacha	Climber	Convolvulaceae	Root Leaf Flower	Used for treating rheumatoid arthritis and cough.	Ku
Aristolochia indica L.	Karalakam	Climber	Aristolochiaceae	Root	Leaf juice is mixed with rhizome juice of Zingiber officinale for blood clotting	Ku Pa
Asclepias curassavica L.	Kammalchedi	Shrub	Asclepediaceae	Whole plant	Decoction of root is used in the treatment of dysentery. Paste of leaves is applied on skin ulcers. Latex is applied on warts.	
Asparagus racemosus Willd.	Sathavari	Climber	Liliaceae	Tuber	Leaf juice is given internally for stomach ache.	
Azadirachta indica A. Juss.	Veppu	Tree	Meliaceae	Leaf	Leaf paste is externally used for chickenpox.	
Bacopa monnieri (L.) pennell	Brahmi	Herb	Scrophulariaceae	Whole plant	The dried plant powder is given internally for the treatment of asthma.	
Boerhaavia diffusa L.	Thazhuthama	Herb	Nyctaginaceae	Leaf Flower	Leaf extract is used internally in the treatment of jaundice and anaemia.	All
Bridelia scandens Gehrm.	Nonivalli	Climber	Euphorbiaceae	Whole plant	Bark decoction is used to cure cough and asthma. Gargling helps in curing sores in mouth. Roots help to reduce inflammation.	Ku
Butea monosperma (Lam.) Taub.	Plashu	Tree	Fabaceae	Latex Seed Leaf	The leaf extract is helping in arresting bleeding. The seeds grounded into powdered form can be consumed to kill worms in stomach. The leaves boiled in water can be used as mouthwash to relieve sore throat.	Ku
Callicarpa tormentosa (L.) L.	Kattuthekku	Tree	Verbenaceae	Bark	Extract of bark is used in the treatment of fever, liver complaints and skin diseases.	Ku
Calophyllum inophyllum L.	Punja	Tree	Clusiaceae	Bark Latex	The latex is rubbed on the skin for treating rheumatism and psoriasis. The resin obtained is used to treat wounds and insect bites.	Ku, Km
Calotropis gigantea R. Br.	Erukku	Shrub	Asclepediaceae	Root Leaf Latex	Root paste is used externally with root paste of *Carica papaya* to induce abortion.	All
Cannabis sativa L.	Kanchavu	Herb	Cannabinaceae	Flower Leaf Latex	Used for mental disorders and head ache.	Ku
Cardiospermum helicacabum L.	Valli uzhinja	Climber	Sapindaceae	Whole plant	The leaf juice is applied on boils and abscess.	All
Careya arborea Roxb.	Pezhu	Tree	Myrtaceae	Whole plant	Bark extract is used for relieving body swellings. Also useful for the treatment of fever and cough.	Ku
Carum copticum (L.)	Ayamodhakam	Herb	Apiaceae	Seed	Beneficial for digestive system. It helps in treating acidity, migraine headache and common cold. It helps in digestion.	Km Pa

Cassia fistula L.	Kannikonna	Tree	Caesalpiniaceae	Leaf	The leaf juice is taken internally curing mouth sores and tonsilitis.	Ku Km
Centella asiatica Urb.	Kudangal	Herb	Apiaceae	Whole plant	Leaves are used internally for anaemia.	Ku Km
Centipeda minima Lour.	Chikkika	Herb	Asteraceae	Leaves	When leaves are squeezed between the fingers and inhaled, it makes the eyes water, clear the head and provoke sneezing. It is also used as a treatment against cough, common cold, and bronchitis.	Pa
Chromolaena odorata (L.) R.M.King & H.Rob	Appa	Herb	Asteraceae	Whole plant	Leaf juice is applied on wounds. Plant leaf and turmeric is ground well and is applied for skin diseases.	Pa
Cinchona calisaya Wedd.	Cinchona	Tree	Rubiaceae	Bark	Used for the treatment of malaria.	Ku
Citrus aurantium L.	Cherunaarakam	Tree	Rutaceae	Fruit	Fruit juice is used as a mouthwash for sore throat. It is also used to treat irritation, diarrhoea and swelling due to mosquito bites.	All
Clitoria ternatea L.	Shangupushpam	Herb	Fabaceae	Root Leaf	Root paste is applied on poison affected regions and also used for eye diseases.	Ku Km
Coleus ambonicus Lour.	Panikoorka	Herb	Lamiaceae	Leaf Stem	The leaf juice mixed with honey is taken internally during respiratory disorders.	All
Coscinium fenestratum Colebr.	Maramanjal	Climber	Menispermaceae	Rhizome	Grinded underground part cures skin diseases and grinded stem is used to treat bleeding piles.	Ku Km
Crinum latifolium L.	Katulli	Herb	Amaryllidaceae	Tuber	The cooked bulb is pressed against foot when it is hot.	Ku Pa
Crotolaria quinquefolia L.	Kilukiluppa	Herb	Fabaceae	Leaf, Seed pod	Seed pod is used for treating snake and millipede bites. Leaves often combined with those of *Crotolaria retusa* is taken internally or externally as a treatment for fever and scabies.	Pa
Cucumis myriocarpus E. Mey ex Naud	Kattuvellari	Climber	Cucurbitaceae	Fruit	The pulp of fruit is taken to treat ulcers and inflammations.	Ku Km
Curcuma neilgherrensis W.	Kattukoova	Herb	Zingiberaceae	Tuber	Rhizome paste is applied for skin diseases.	Ku
Cyathocline lyrata Cass.		Herb	Asteraceae	Leaf	Used in treatment of skin diseases and wounds.	Ku
Cyclea peltata Cooke.	Padakizhangu	Climber	Menispermaceae	Root	Oil prepared from rhizome is used for tooth ache.	Ku Pa
Cymbopogon citratus Stapf.	Inchipullu	Herb	Poaceae	Leaf Oil	It is used to relieve the problems of rheumtic joints, sprains and tooth related problems.	All
Cynodon dactylon Pers.	Karukapullu	Herb	Poaceae	Whole plant	Leaf paste mixed with turmeric rhizome is applied for inflammations.	Km
Cyperus kyllingia Endl.	Muthanga	Herb	Cyperaceae	Rhizome	The rhizome paste mixed with milk is taken to cure dysentery	All
Datura stramonium L.	Ummam	Shrub	Solanaceae	Leaf Root Seed	The burning leaf smoke is used to treat asthma and bronchitis. The oil from seed is used to treat baldness.	Ku Pa
Deris sp.	Pannivalli	Climber	Fabaceae	Leaf	Leaves decoction is used in treating sprains.	Ku
Eclipta prostrata (L.)L.	Kanhunni	Herb	Asteraceae	Whole plant	Plant extract is used for the treatment of dandruff.	Ku Km
Emblica officinalis, Gaertn.	Nelli	Tree	Euphorbiaceae	Fruit Root Bark	Fruit helps to burn unwanted fat from the body. It is helpful in controlling diabetes.	All
Emilia sonchifolia DC.	Muyalchevian	Herb	Asteraceae	Leaf	Leaf paste is used for tonsillitis and skin diseases.	Ku Km
Eucalyptus globulus Labill.	Eucalyptus	Tree	Myrtaceae	Leaf Oil	The essential oil obtained from leaves is used as an inhalant which helps to soothe chest infections. Leaves are externally used as a chest rub for influenza.	All
Eupatorium triplinerve, M. Vahl.	Ayyappana	Sshrub	Asteraceae	Whole plant	Its oral intake prevents bleeding, detoxifies blood and cures piles. Helps in treating snake poison.	Ku Pa
Evolvulus alsinoides, L.	Vishnukranthi	Herb	Convolvulaceae	Whole plant	Ground and mixed with rice water and taken I empty stomach to improve memory of ageing people.	Ku
Garcinia gummi-gutta (L.) Roxb.	Kudampulli	Tree	Clusiaceae	Seed Leaf Fruit	Used to cure ulcer and tonsillitis.	Ku
Gardenia resinifera Roth	Gandharajan	Tree	Rubiaceae	Gum	The gum extracted is used to treat skin diseases and rheumatoid arthritis.	Ku

Gloriosa superaba L.	Menthonni	Climber	Liliaceae	Tuber	Root paste is applied on the spot of scorpion bite and used for the treatment of head louse.	Km Ku
Glycosmis pentaphylla Corr.	Panal	Shrub	Rutaceae	Whole plant	The whole plant extract is used for respiratory and heart diseases.	Ku Km
Glycyrrhiza glabra L.	Irattimaduram	Herb	Fabaceae	Root	Used for the treatment of warts and epilepsy.	Ku
Gymnema sylvestre R. Br.	chakkarakoli	Climber	Asclepediaceae	Leaf	Leaf paste is externally applied on wounds. Leaves are eaten for diabetes.	Ku
HelIcteres isora L.	Edampiri valampiri	Shrub	Sterculiaceae	Fruit	Dried fruit powder with fruit powder of *Phyllanthus emblica* is used internally in the treatment of dysentery and cough.	Ku Km
Hemidesmus indicus R. Br.	Nannari	Climber	Asclepediaceae	Root	Root decoction is taken for the treatment of diabetes.	All
Holostemma ada kodien Schult	Adapathiyan	Climber	Asclepediaceae	Tuber	Root decoction is used for improving body health.	Ku
Ichnocarpus frutescens R. Br.	Paalvalli	Climber	Apocyanaceae	Root	Root juice is used for the treatment of anaemia.	Ku
Illicium verum Hook. f.	Thakolam	Tree	Magnoliaceae	Fruit Oil	Treatment of bronchitis	Ku Km
Indigofera tinctoria L.	Neela amari	Shrub	Fabaceae	Whole plant	Leaf juice is used for the preparation of oil for hair growth and root juice is taken internally for snake poison, rat poison.	Km Ku
Justicia gendarussa L. f.	Vathamkolli	Shrub	Acanthaceae	Leaf	Used for the treatment of rheumatism.	All
Lawsonia inermis L.	Maylanchi	Tree	Lythraceae	Leaf	Leaves paste is used against skin and nail complaints.	Pa Ku
Leucas zeylanica R. Br.	Thumba	Herb	Lamiaceae	Young stem, Root, Leaf	Young stem along with root and leaves is made into paste and made into oil and applied for cold and headache.	Ku
Kaempferia galanga L.	Kacholam	Herb	Zingiberaceae	Tuber	Rhizome paste is applied on forehead for head ache.	Ku Km
Memecylon malabaricum Cogn.	Kashavu	Shrub	Melastomaceae	Leaf	The leaf powder is hypoglycemic.	Ku
Mesua ferrea L.	Nagapoomaram	Tree	Clusiaceae	Flower	It helps against burning of feet, helps the treatment of stomach pain, vomiting.	Ku
Mimosa pudica L.	Thottavadi	Herb	Mimosaceae	Leaf	The leaf paste is applied externally on wounds.	Ku Pa
Mitragyna purvifolia Korth.	Idinjil	Tree	Sterculiaceae	Bark	The bark grounded is mixed with egg white and applied on sprained part of body.	Ku Pa
Mucuna prurita, Hook.	Naykuranna	Climber	Fabaceae	Whole plant	The plant made into a paste is applied on ectoparasitic infection in cattles.	Ku,Pa
Murraya koenigii, L.	Kariveppu	Shrub	Rutaceae	Leaf Bark Root	Leaf juice is used for the preparation of oil for hair growth. Patients are made to smell leaves in case of epilepsy.	
Nymphaea stellata Burm. f.	Ambal	Herb	Nymphaeceae	Stem Flower Tuber	It is used in many polyherbal formulations for anti-ageing and menstrual irregularities. Flowers used as a remedy for kidney problems.	
Ocimum tenuiiflorum L.	Thrithavui	Shrub	Lamiaceae	Leaf Seed	Leaves are boiled in water and the steam inhaled for cold, cough and fever. Oil prepared with leaves is used for ear pain.	
Oxalis corniculata L.	Pulyarila	Herb	Oxalidaceae	Whole plant	Used in stomach problems. Decoction of leaves is given for fever and dysentery.	
Phyllanthus amarus Schum. & Thonn.	Keezharnelli	Herb	Euphorbiaceae	Whole plant	Plant extract with rhizome paste of turmeric is used internally for skin diseases and jaundice.	All
Piper betel L.	Vetilla	Climber	Piperaceae	Leaf	Used against cuts and wounds.	All
Piper longum L.	Thipali	Climber	Piperaceae	Fruit	The mature spike is eaten raw for control of cough. Spike decoction for controlling stomach ache.	Ku, Pa
Plumbago auriculata Lam.	Neela koduveli	Shrub	Plumbaginaceae	Root	The powdered root is used as snuff to relieve headache. It helps to cure skin diseases like warts.	Ku Km
Plumbago zeylanica L.	Vellakoduveli	Herb	Plumbaginaceae	Root	The roots are used in the treatment of digestive system like weak digetion, grahni, piles and abdominal pain	Ku, Km
Pogostemon cablin Benth	Pacholi	Herb	Acanthaceae	Leaf Stem	The essential oil obtained from leaves is used in aromatherapy to treat nervous exhaustions, depressions.	Ku
Pongamia pinnata (L.) Pierre	Ungu	Tree	Fabaceae	Seed	The seed powder juice kills pinworms.	Ku, Km

Rauvolfia serpentina (L.) Benth.ex Kurz	Amalpori	Shrub	Apocyanaceae	Root	Rhizome juice is used internally for high blood pressure and forthe treatmentof snake poison.	All
Ricinus communis L.	Avanakku	Shrub	Euphorbiaceae	Young leaf Root	The leaf paste is mixed with milk and is used for head ache.	Km
Rotula aquatica Lour.	Kaloor vanchi	Shrub	Boraginaceae	Root Leaf	Decoction is taken for treating kidney stone. The leaf paste is diluted and drunk for controlling menstrual bleeding in women.	Ku
Ruta graveolans L.	Arutha	Shrub	Rutaceae	Leaf Flower	The ground flower paste is applied over the snake bitten portion to absorb poison.	All
Saraca asoca (Roxb) Willd	Asokam	Tree	Caesalpiniaceae	Bark Flower	Root bark decoction is taken internally in case of irregular menstruation and chewing flowers is recommended for bleeding.	Km Ku
Sarcostemma acidum (Roxb.)	Somalatha	Shrub	Asclepediaceae	Whole plant	Used for the treatment of mental disorders, rabies, intestinalproblems.	Ku
Saussurea lappa (Decne.) Sch. Bip.	Kottam	Shrub	Asteraceae	Root	Root extract used in treating respiratory disorders and leprosy.	All
Scoparia dulcis L.	Kallurukki	Herb	Scrophulariaceae	Root	Ground root is taken orally for kidney stone.	Ku
Securinega virosa Roxb. (Ex Willd)	Neroori	Shrub	Euphorbiaceae	Leaf	Leaf decoction is used in the treatment of stomach troubles.	Ku
Sida rhombifolia L.	Kurunthotti	Herb	Malvaceae	Whole plant	Root decoction is used for rheumatism, breathing problems and cough.	Km, Pa
Simarouba glauca DC.	Lakshmi taru	Tree	Simaroubaceae	Leaves	Used in treatment of cancers and tumours. Leaves decoction can raise the immunity power.	Pa
Smilax zeylanica L.	Chakkuvalli	Climber	Liliaceae	Leaf,Root	Decoction of root is taken to treat skin diseases. Decoction of leaves acts as blood purifier and improves sexual viguor.	Ku
Solanum biflorum Lour.	Chundakaayi	Shrub	Solanaceae	Whole plant	Plant parts decoction can be used in the treatment of blood pressure and diabetes.	Km
Solanum torvum Sw.	Puthiri chunda	Shrub	Solanaceae	Whole plant	Root paste is applied for poison. Raw fruits are eaten for pinworms.	Ku
Stereospermum tetragonum DC.	Chuvanna akil	Tree	Meliaceae	Bark	Extract of bark is used to treat diarrhoea.	Ku
Tabemaemontana divaricata R.Br.ex Roem. & Schult	Nanthyarvattam	Shrub	Apocyanaceae	Flower	Flower juice along with breast milk is given as eye drop	Ku
Terminalia arjuna (Roxb.) Wight & Arn.	Neermarudhu	Tree	Compretaceae	Bark	Bark is used for chronic heart failures and also for sprains.	Ku Km
Thespesia populnea (L.) Sol ex Correa	Poovarashu	Shrub	Malvaceae	Fruit	Leaf decoction is used as a drink in case of abscess due to severe heat.	Ku,Km
Thottea siliquosa (Lam.)	Alpam	Shrub	Aristolochiaceae	Root Leaf	Leaf paste is applied for head ache.	Ku
Tinospora cordifolia (Thunb.) Miers	Chitamruthu	Climber	Menispermaceae	Stem	Plant decoction is taken internally for gonorrhea and diabetes.	All
Trichopus zeylanicus Gaertn.	Arogyapacha	Herb	Diascoreaceae	Flower Fruit	Tonic made from fruit and flower is used to improve stamina, boosting immune system, losing body weight.	Ku,Km
Vernonia cineria (L.) Less.	Poovamkurundal	Herb	Asteraceae	Whole plant	Plant paste is used for joint pain.	Km
Vetiveria zizanoides L.	Ramacham	Herb	Poaceae	Root	Leaves for the treatment of rheumatism.	All
Vinca rosea L.	Nithyakalyani	Herb	Apocyanaceae	Root Leaf	The leaf extract is used to treat cancer, blood pressure and diabetes.	Ku Pa
Vitex negundo L.	Karinochi	Shrub	Verbenaceae	Leaf Root	Extract is used for treating tuberculosis, malaria and epilepsy.	All
Vitis quadrangularis (L.) Wall. Ex Wight	Changalamparanda	Climber	Vitaceae	Tendril Leaf	The leaf extract is used to retain sprained body parts.	Ku
Withania somnifera (L.) Dunal.	Aswagantha	Shrub	Solanaceae	Root Leaf	Leaf extract helps to increase testosterone & induce pregnancy. Used to cure heart diseases.	Ku

*Tribes associated: Ku- Kurichiya, Km- Kuruma and Pa-Paniya

Results and Discussion

The ethnomedical knowledge can provide a very effective strategy for the discovery of useful medicinally active identity. It is very essential to have a proper documentation of medicinal plants and to know their potential for the improvement of health and hygiene through an eco-friendly system. The present study exposed that the Kurichiya, Kuruma and Paniya communities of Wayanad district have adequate ethnobotanical knowledge which has been transmitted from generation to generation. But, they often keep the knowledge about medicinal plants as a secret within the family circles only. In the present study, information on medicinal plants with the botanical name (alphabetical order), local name, habit, family, part used, therapeutic use and tribes associated are tabulated in Table 1.

During the present investigation, it was noted that 114 angiosperm medicinal plant species belonging to 47 families used by the Kurichiya, Kuruma and Paniya tribes of various regions of Wayanad district for the treatment of various ailments. These were enumerated with their medicinal importance. Out of the 114 plant species studied, 100 (87%) were dicotyledons and 14 (13%) were monocotyledons. The plants of maximum use record belong to Fabaceae, Asteraceae (8 species each) followed by Euphorbiaceae and Asclepediaceae (6 species each) then Rutaceae and Apocynaceae (5 species each) (Table 1). The common health ailments treated in the study area were skin problems, wound, toothache, kidney stone, urinary troubles, arthritis, piles, headache, cough and cold, fever, sprains, diabetes, diarrhea, blood pressure, jaundice etc.

Deviprasad and Shyma documented 295 medicinal plant species belonging to 93 families used by the Kurichiya, Kuruma, Kattunaika, Adiyan and Paniya tribes residing at different forests of Mananthavady taluk [4]. They are also observed that most of the tribal medicines in this region are being prepared from the members of Fabaceae followed by Euphorbiaceae and Asteraceae. An ethnobotanical survey of Kannur district has revealed the use of 93 species of plants by the tribals of the district [9]. Use of 79 plant species for ethnobotanical purposes by the tribals of Kerala [10] and 41 plants belonging to 27 families being used by Kadar tribes of Sholayar district of Kerala have also been documented [11]. The study conducted on traditional remedies of Kani tribes of Kottoor reserve forest revealed the use of 50 plant species belonging to 33 families of which Fabaceae and Asteraceae are more frequently used [12]. Ranjith *et al.* recorded 52 single and 10 combinations of plant remedies for wound healing in the Kasargod district of Kerala [13].

Analysis of data based on the growth showed that among 114 species, 39 are herbs, 28 are shrubs, 26 are trees and the remaining 21 are climbers (Figure 1). The present study revealed that herbs are the primary source of medicinal plants in terms number of plants contribution (34%) followed by shrubs (24%), trees (22%) and climbers (18%). The ethnomedical survey conducted by Hari Babu and Seetharami Reddi [14] for fevers by the tribes of Visakhapatnam district showed that habit wise analysis with the dominance of herbs with 23 species followed by trees, shrubs, and others. However, the study conducted by Deviprasad and Shyma observed that trees are the primary source of medicinal plants followed by herbs, shrubs, and climbers during the ethnobotanical survey among the tribes of Vythiri taluk of Wayanad district [3]. Tribal people make use of plants belonging to the herb community more followed by shrub, tree, and climbers the least. In the present study, among the plant categories studied Kurichiya uses more herbs (29 species), shrubs (26 species), trees (23 species) and climbers (19 species) than that of Kurumas and Paniyas (Figure 2). The study conducted by Raghavendra *et al.* was also noticed similar results in the case Kurichiya tribes of Wayanad district [15].

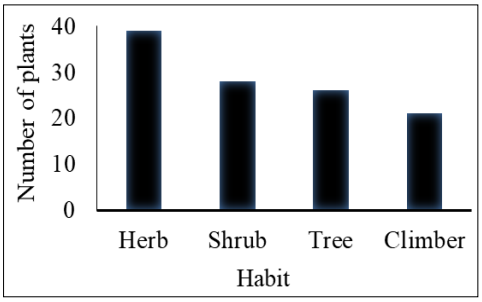

Fig 1: Analysis of medicinal plants based on growth forms

The tribes are using various plant parts such as leaves, root, whole plants, barks, fruits, flowers, tubers, seeds, latex, rhizomes, gum etc. for the treatment of various diseases. The present study also investigated the plant parts used against various diseases. It is noticed that 13 plant parts and their combinations were used for the folklore treatment (Table 2). Among the plant parts used, the major contribution by leaf with 32.5% followed by root (23.7%). Around 23.6 % of the whole plants are used entirely. Even though all plant parts are valuable, the preparation of a formulation requires specific parts of plants. However, the tribes of Mananthavady area are using various plant parts such as leaves (110 species), barks (58 species), whole plants (56 species), roots (35 species), fruits (37 species), seeds (26 species) and underground parts (25 species) of different species [3]. Ranjith *et al.* observed that leaves are major parts used for the treatment of wounds, which may be due to the continuous availability of drug source [13]. The study conducted by Angala *et al.* on Paliya tribes of Idukki concluded that leaves are the most commonly used plant part followed by fruit, seed, root, whole plant, bark, tuber, rhizome and flower bud [16].

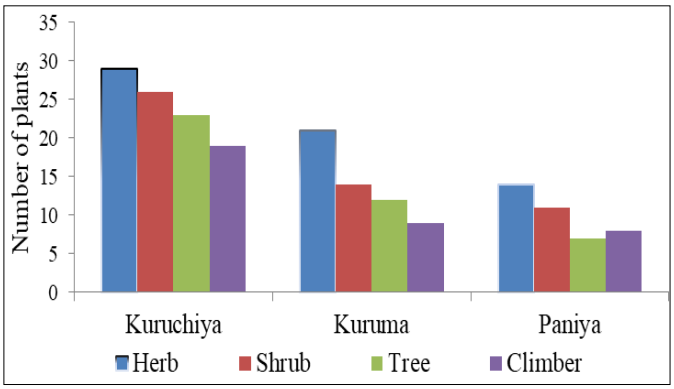

Fig 2: Comparison of medicinal plants used by tribes

The use of medicinal plant species varies among three tribal groups studied. The present study reveals that the local healthcare practices of Kurichiyar tribe in Wayanad district are very important. They possess good knowledge of herbal drugs when compared with the other two communities *i.e.*, Kuruma and Paniya. Ethnobotanical studies in the Wayanad district, Kerala documented information on 165 edible plants used by Kattunaika, Paniya and Kuruma tribes and according to them[17] Paniya tribes possess knowledge regarding 136 taxa of wild edible plants, Kattunaikas coming next with knowledge of 97 taxa and Kurumas are at the bottom of the knowledge – ladder with knowledge of 42 taxa of wild edible plants. Silja *et al.* [2] revealed the use of 136 plant species for traditional purposes used by the Kuruma tribe of Wayanad district.

Table 2: Analysis of plant parts used as medicines

Plant parts used	No of plants	Percentage
Leaf	37	32.5
Whole plant	27	23.7
Root	27	23.7
Bark	12	10.5
Fruit	11	9.6
Flower	9	7.9
Tuber	8	7.0
Seed	8	7.0
Latex	4	3.5
Rhizome	3	2.6
Oil	3	2.6
Gum	1	0.9
Young stem	1	0.9

Among the 114 plant species recorded, Kurichyas exclusively uses six fold times plants (38 plants) when compared to Kurumas (7 plants) and Paniyas (5 plants). Devi Prasad and Shyma documented 67 medicinal plant species used by various tribes of Vythiri taluk of Wayanad district of which Kurichiyar is using most of the medicinal species in which most of them are the herbal community [4].

Conclusion

The aim of the study was to carry out an ethnobotanical survey of flowering plant species used by three tribal communities (Kurichiya, Kuruma, and Paniya) for the treatment across the tribal settlements of Wayanad district. Even though the knowledge of the tribe is amorphous, they possess a wealth of information regarding plant communities used against various diseases. Differences were observed among the tribal groups in the level of knowledge endowed upon various communities and are evident from the variation in the treatment described for selected diseases. Considering all use categories, there was a significant difference between the total numbers of species reported by the three groups. Another interesting fact to note is that the extracts of more than one plant were used for treating single ailments. At the same time, the same type of plant can be used in curing various ailments in different communities. This precious knowledge is transferred from generation to generation combining years of experiences, practices from their forefathers but all the information is lacking a written script. Here the present study is important for researchers, the scientific community, medical practitioners, pharmaceuticals etc. It is the need of the hour to encode and preserve the oral knowledge for the sake of the society and generations to come. Therefore, it was very essential to gather ethnobotanical information in detail so as to understand the plant-people interaction and to document such valuable information with a comprehensive and multidisciplinary approach for the prosperity.

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