



Original Article

ISSN : 2277-3657  
CODEN(USA) : IJPRPM

## ***Ethno-Medicinal Survey of Targeted Tribes in Idukki District, Kerala***

**Ranjithkumar Murugesan<sup>1</sup>, David Noel Stephen<sup>2\*</sup>, Tamizhazhagan Vairakannu<sup>3</sup>, Manikandan Gurusamy<sup>4</sup>, Sattanathan Govindharajan<sup>5</sup>**

<sup>1</sup>PG Department of Microbiology, Syed Ammal Arts and Science College, Ramanathapuram, Tamil Nadu, India.

<sup>2</sup>Department of Biology, School of Science, Gandhigram Rural Institute - Deemed to be University, Dindigul, Tamil Nadu, India.

<sup>3</sup>PG Department of Zoology, Syed Ammal Arts and Science College, Ramanathapuram, Tamil Nadu, India.

<sup>4</sup>Department of Pharmaceutical Sciences, Tshwane University of Technology, Pretoria - 0083, South Africa.

<sup>5</sup>Key Laboratory of Coho Salmon Culturing Facility Engineering, Institute of Modern Facility Fisheries, College of Biology and Oceanography, Weifang University, Weifang 261061, China.

\*Email: [noel22david@gmail.com](mailto:noel22david@gmail.com)

### **ABSTRACT**

An ethnobotanical study was carried out among Mannan, Urali, and Paliyan communities at Kozhimala and Chakkupallom villages of Idukki dist, Kerela. Information on one hundred plants used by them as a source of medicine for various ailments was collected through a questionnaire. Totally 68 plant species were collected from the Mannan community, 16 from the Urali, and another 16 from the Paliyan community. The plant parts used as sources of medicine by targeted tribes were, leaves (52%), followed by roots (29%), stem, and bark (20%) Fruit and seed (19%), Whole plant (14%) Latex and resin (5%), flower and other parts (6%). Among which, mostly preferred plant parts as a source of medicine in the Mannan tribe were the leaf (35%) followed by root parts (16%), stem and bark (15%), fruit and seed (11%). Whole plant (6%) latex and resin (5%) flower and other parts (4%) whereas Urali tribes used root parts (9%) leaf (5%) seed and fruit (3%) bark (3%) whole plant (3%) and flower (2%) and Paliyan used leaf (12%) followed by whole plant (5%), seed (5%) and root parts (4%). Mannan mostly use herbs (32%) as their medicine followed by Trees (21%) also shrubs (15%) and climbers (5%). Urali tribes use Herbs (9%), shrubs (8%), climbers, and trees 3% each. Paliyan tribes mostly use Herbs (15%), followed by trees (9%), Shrubs (3%), and climbers (1%).

**Keywords:** Ethnobotanical study, Paliyan tribes, Mannan tribe, Plant parts, Herbs

### **INTRODUCTION**

India has been rich in its tribal population from time immemorial with a traditional knowledge system that deals with many significant aspects and health issues of tribal communities. The traditional knowledge of medicinal plants in the tribal people is very ideal. The tribes of India constitute 8.2% of the total population [1]. India has the largest number of tribes as compared to any other country. The tribal community and their habitation constitute very important parts of our country's environment and ecology.

About half of the tribal population of the world lives in India. Kerala has many diverse ethnic tribal communities and they follow the traditional system of healing with the help of various biological resources. Each tribal community has a different lifestyle and they are distributed in various parts of Kerala [2]. The scheduled tribe population in Kerala is about 364,189. Wayanad has the highest number of tribals – 50973 and Palakkad – 39665. The Paniyar are the highest of the 35 major tribes. The most common tribes in the Idukki district are Malapandaram, Malappulayan, Malayarayan, Paliyan, Ulladan, Urali, Muthuvan, and Mannan [3]. Basic Data Sheet, District Wayanad, Kerala.

Idukki is the second largest place in Kerala with 245 tribal settlements of which 74 are in Thodupuzha; 11 in Peermedu; 126 in Devikulam and 34 in Udumbanchola Taluks of this district. Almost all the scheduled tribes live in the extremely remote hilly banks and the deep interiors of the thickly growing forests of this district. According to the most recent census, around 11,516 scheduled tribal families such as Malayarayan, Mannan, Muthuvan, Oorali, Paliyan, Hilpulaya, Malapandaram, Ulladan, Malayan are living in Idukki district [4].

Almost all of the tribal groups have developed their traditional system of medicines that are often accompanied by paraphernalia like symbolic sacrifices, magical incantations, and mysticism. Most of the tribal communities live in and around dense forests and have maintained their own culture, food habits, and socio-religious traditions. Tribal communities have an intricate relationship with their surrounding vegetation [4]. The natural products which are obtained from plants have been used traditionally by the Tribals in healing diseases. The extracts that are prepared from various plants are gaining attention and are used as potential therapeutic agents. The knowledge of medicinal plants is more prevalent among the indigenous people who secured the traditional knowledge from their ancestors [5]. The tribes mainly depend on the forest for their living. They prepare extracts of plants, powder, decoction paste, etc for the treatment of various ailments. They do not go to any hospital. Kerala holds a unique position in the tribal map of India [6]. The tribal communities make use of non-timber forest products and medicinal preparation based on indigenous knowledge. The various parts of plants such as leaves, stems, bark, roots, fruits, flowers, etc. possess many active ingredients that have a main role in the treating or curing of an ailment. Usually, these tribal groups make use of local or nearby plants in and around their settlement for the treatment, they have undertaken many trials of identification of herbs and diseases.

The study explores and documents the ethnomedicinal knowledge of the medicinal plants used by tribals such as Mannan, Paliyan, and Urali in the Idukki district of Kerala.

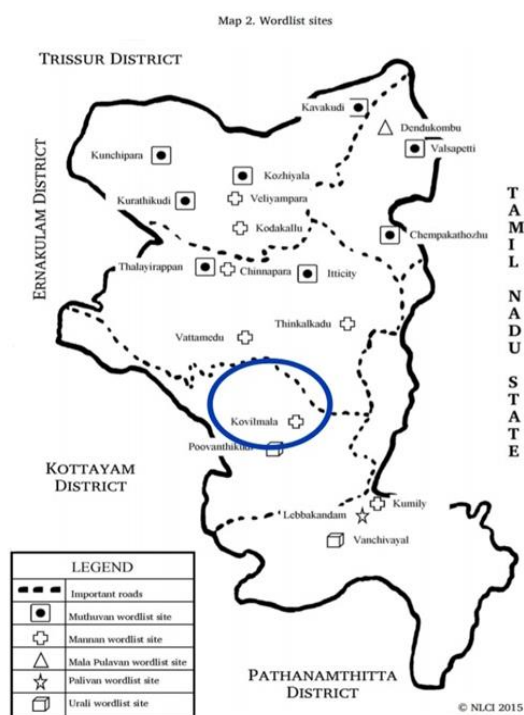
#### Study area

##### Mannan and urali

The study area for Mannan and Urali drops in the Kovilmala Region. Kovilmala, locally known as Kozhimala (the hill of hen), is a tribal settlement and a small village near Kattapana in the district of Idukki in Kerala state, India. Geographically the area lies between 9°42'16.343" N latitude and 77°2'23.988" E longitude.

##### Paliyan

The study area is in Chakkupallom Village of Idukki district Kerala. The total geographical area of the village is 2833 hectares. Geographically the area lies between 9.6527° N Latitude and 77.1226° E Longitude (**Figures 1 and 2**).



**Figure 1.** Kovilmala Settlement



Figure 2. Idukki District Map

## MATERIALS AND METHODS

### *Ethnomedicinal survey data collection*

The ethnomedicinal survey in the Idukki District among the tribals of various communities was carried out and the preliminary data were obtained from different communities (Mannan, Urali, and Paliyan). The information was collected from the tribal people using a questionnaire. Throughout the interviews, local plant names, usable plant parts, preparation methods for medicine, application mode, and storage were recorded. All gathered information was cross-checked with individuals of the same communities from where the plant material was collected. The collected plants were then identified by qualified taxonomists. The questionnaire was designed to obtain the information of socio-demographic information about traditional practitioners including name, gender, age, literacy, and knowledge about the plants they used to treat, their experience in the field of treatment, the method of diagnosis, and the treatment methods.

### *Identification and collection of plants*

Information on one hundred plants used for the treatment of various ailments was collected from different places of villages such as Kozhimala and Chakkupallom, of which 68 plant species were collected from the Mannan community, 16 from the Urali, and another 16 from Paliyan community. The plant species were identified by specimen display method and confirmed through repeated field visits to the healers in different seasons. Each informant was interviewed more than twice to confirm the reliability of the information and those that were not consistent were rejected as being unreliable. All plants recorded were photographed in the field.

## RESULTS AND DISCUSSION

The results of the survey are presented in **Tables 1-3**. For each species the following ethnomedicinal information is provided; Botanical Name, Family, Local name, Part used, ailments treated, and mode of preparation. Totally 100 plants belonging to 45 families, were identified as being used for the treatment of approximately 42 ailments.

There are 42 herbs, 23 shrubs, 25 trees, and 12 climbers. In most of the cases (52%) leaves were used for curing ailments followed by root parts (29%), stem and bark (20%), fruit and seeds (19%), whole plant (14%), latex and resin (5%), flower and other parts (6%). Apocyanaceae, Zingiberaceae, and Fabaceae had the largest number of plants used. Among these twenty plants are used for different Gynecological problems. Seven plants are used as a remedy for Typhoid and ten different plants are used to cure wounds. Medicines are prepared in the form of juice/extract followed by infusion, powder, decoction, paste, and as such to cure various diseases mainly vitiligo, gynecological problems, wounds, jaundice, cough/colds, typhoid, kidney problems, snakebite, skin problems, worm infections, filariasis, body pain, diabetics, arthritis, hemorrhoids, headache, etc.

**Table 1.** Medicinal plants used by Mannan tribes

Family	Botanical Name	Local Name	Part Used	Disease Cured	Method of Preparation
Zingiberaceae	<i>Curcuma aeruginosa</i>	Karimanjal	Rhizome	Vitiligo Disease	<i>Curcuma aeruginosa</i> and leaves of <i>Vitex negundo</i> are powdered and placed in the de-pigmented skin. The Bark of <i>Pterocarpus marsupium</i> and <i>Bridelia retusa</i> is boiled in water, and after cooling, the whitish patches this water.
Lamiaceae	<i>Vitex negundo</i>	Karinachi	Leaf		
Fabaceae	<i>Pterocarpus marsupium</i>	Karuvenga	Bark		
Phyllanthaceae	<i>Bridelia retusa</i>	Mulluvenga	Bark		
Apocyanaceae	<i>Tabernaemontana alternifolia</i>	Koonampaala	Seed	Vitiligo Disease	The seed is grinded and applied to the whitish patches.
Malvaceae	<i>Sida alnifolia</i>	Kurundhooti	Leaf	Kidney Problems	Leaf of <i>Sida alnifolia</i> , <i>Mimosa pudica</i> , and <i>Breynia vitis-idaea</i> are grinded and taken orally.
Pteridaceae	<i>Adiantum raddianum</i>	Pachapottu	Leaf	Kidney Problems	Leaves of <i>Adiantum raddianum</i> and <i>Breynia Vitis-idaea</i> are grinded, rolled, and taken in the form of a tablet (also as a solution)
Phyllanthaceae	<i>Breynia vitis-idaea</i>	Neerootti	Leaf		
Lythraceae	<i>Lagerstroemia microcarpa</i>	Vellilaavu	Young leaves	Typhoid	All the ingredients are grinded and taken in 2-3 dishes separately. Water is added if the dose is more. It is given when patients show symptoms like cough. Food given during the treatment is "Podiyarikanji" Treatment requires about months based on the age of the patient. <i>Persea macrantha</i> is given to detect Typhoid, after giving the latex patient shows some anger and anxiety.
Oxilidaceae	<i>Averrhoa bilimbi</i>	Pulichikya	Leaf		
Convolvulaceae	<i>Argyrea nervosa</i> (Burm.f.) Bojer.	Motta kaachil	Seed		
Rhamnaceae	<i>Ziziphus rugosa</i>	Kottamullu	Peels of Bark		
Lauraceae	<i>Cinnamomum tamala</i>	Idanm edana	Peel of Bark		
Lauraceae	<i>Persea macrantha</i>	Kolamaavu	Latex		
Phyllanthaceae	<i>Phyllanthus maderaspatensis</i>	Keezhanelli	Leaves	Jaundice	Leaves are grinded and made in the form of tablets. Mixed this tablet in half a glass of Milk and drunken for about 3 days.
Plantaginaceae	<i>Scoparia dulcus</i>	Kallurukki	Whole plant	Oliguria	The whole plant is grinded, and the juice is taken from the decoction and drunken.
Plantaginaceae	<i>Scoparia dulcus</i>	Kallurukki	Leaf	Sore-eye	The leaf is squeezed and rubbed in hand, juice is mixed with honey, Added 2 drops in the eyes once a day.
Tiliaceae	<i>Grewia tillifolia</i>	Unnam	Bark	Hemorrhoids	The bark is taken and grinded, the decoction is applied directly, and after one hour itself patient shows some relief, this decoction can be also taken in. (Chicken curry and pickles have to be avoided)

Lamiaceae	<i>Ocimum tenuiflorum</i>	Thulasi	Leaf	Ear pain	1 Drop of leaf juice poured into the ear
Meliaceae	<i>Azadiracta indica</i>	Veppu	Leaves	Ring Worm	Leaves of <i>Azadiracta indica</i> and rhizome of <i>Curcuma longa</i> are grinded together and applied to the infected part.
Zingiberaceae	<i>Curcuma longa</i>	Pacha Manjal	Rhizome		
Lythraceae	<i>Lagerstromia speciosa</i>	Manimarudhu	Peel of Bark	Typhoid/Tonsil	The Peel of bark is grinded and taken in, and the peel of bark is collected using a stick-avoiding knife.
Caricaceae	<i>Carica papaya</i>	Papaya	Fruit	Worm infection in the stomach	Half-ripened fruit cut into pieces, boiled in water, and eaten
Acanthaceae	<i>Hemigraphis alternata</i>	Murikooti	Leaf	Wound	The leaf is grinded and placed in the wound
Lythraceae	<i>Lagerstroemia speciosa</i>	Mani maruthu	Latex	Wound	Latex of plant is applied to the wound
Euphorbiaceae	<i>Macaranga peltata</i>	Raajavatta	Latex	Wound	Latex is collected by scrubbing the bark, which is applied to the wound directly.
Lecythidaceae	<i>Careya arborea</i>	Pezhu	Peel of bark	Blood Purification	The Peel of the bark is boiled and the decoction is administered orally early morning. It purifies blood and kills germs in the blood. The dose depends on the age of the person. If a dose is more there is a chance of vomiting treatment requires 3-4 days. The seeds are given to the vigorous mad dogs so that their teeth are lost.
Polygonaceae	<i>Persicaria sp.</i>	Pulunkaanji	Young leaves	Cough	Young leaves are grinded and taken in the solution.
Crassulaceae	<i>Kalanchoe gastonis bonnieri</i>	Kallodukki	Leaf	Urinary Retention	Leaf grinded and given as a tablet. Give cumin-boiled water along with it.
Ranunculaceae	<i>Naravelia zeylanica</i>	Vaadhakodi	Whole plant	Arthritis	the whole plant along with the root is plucked and cut into pieces, added the leaves of <i>Eucalyptus globulus</i> , and boiled in water for bathing.
Myrtaceae	<i>Eucalyptus globulus</i>	Yukkali	Leaves		
Solanaceae	<i>Physalis angulata</i>	Njottanjodiyan	Edible fruit	Headache during the time of pregnancy	The fruit is grinded and applied on the forehead.
Solanaceae	<i>Physalis angulata</i>	Njottanjodiyan	Leaves	Itching on the skin; smallpox pustules; Vitiligo lesions; Guinea worm sores.	Leaves are grinded and applied to the affected area.
Apocyanaceae	<i>Hemidesmus indicus</i>	Nannari	Tuber	Anemia	Tuber of the plant is grinded, made as a tablet, and drunk with milk.
Zingiberaceae	<i>Zingiber officinale</i>	Inji	Rhizome	Improper Digestion	Rhizome juice, salt, and lemon juice mixed well and taken in.
Rutaceae	<i>Citrus lemon</i>	Cheru naarangya	Fruit		
Fabaceae	<i>Macrotyloma uniflorum</i>	Mudhira	Seed	Sweating smell	Seed is grinded and used for bathing

Fabaceae	<i>Mimosa pudica</i>	Thottavadi	Whole plant	Kidney problems	20 twigs of <i>Breyniavitis idaea</i> , 10 whole plants of <i>Mimosa pudica</i> , and 5 Twigs of <i>Scoparia dulcus</i> were grinded, and the paste was made as a tablet and taken orally.
Fabaceae	<i>Mimosa pudica</i>	Thottavadi	Leaf	Sprain	Leaf grinded with salt mixed with water left after cooking rice and then boiled. After cooling apply it to the affected area.
Fabaceae	<i>Mimosa pudica</i>	Thottavadi	Leaf	Diabetics	Leaves are grinded and juice is taken once each in the early morning
Fabaceae	<i>Mimosa pudica</i>	Thottavadi	Leaf	Over Menstrual Bleeding	Leaf juice Honey is taken in.
Apocyanaceae	<i>Tabernaemontana divaricata</i>	Nandyaarvattam	Leaf and flower	Eye pain	Leaf and flower are grinded and the juice is taken and mixed with breastmilk, add 2-3 drops into the eyes.
Apocyanaceae	<i>Callotropis gigantea</i>	Erikku	Latex	Tooth Cavity	Latex is taken and added to holes of teeth.
Asteraceae	<i>Eclipta prostrata</i>	Kayyonni	Leaf	Filariasis	The leaf is grinded with Gingelly oil and applied to the infected area
Zingiberaceae	<i>Curcuma longa</i>	Pachamanjal	Rhizome	To avoid stretch marks in the abdomen during time of pregnancy	From the 3 <sup>rd</sup> month of pregnancy, grinded the rhizome using coconut oil and applied in the abdomen
Vitaceae	<i>Cissus quadrangularis</i>	Changalam paranda	Leaf and stem	Deals with problems in bones like dislocation, breakage, Backache	It is a Bone setter. Juice of <i>Cissusquadrangularis</i> grinded along with bark of <i>Commiphora caudata</i> and juice is taken, and applied to the body part.
Vitaceae	<i>Cissusquadrangularis</i>	Changalam paranda	Stem	Stomach pain	Stem is dried, powdered, mixed with <i>Curcuma longa</i> powder, salt, and taken in.
Anacardiaceae	<i>Lannea coromandelica</i>	Uthi	Root	Wound	The root is cut into pieces, Steam cooked along with leaves of <i>Macaranga peltata</i> , and the paste is applied to the wound, the water can be also taken orally.
Oleaceae	<i>Fraxinus sp.</i>	Marudhi	Latex		Black Latex is collected and applied directly to the wound.
Euphorbiaceae	<i>Macaranga peltata</i>	Raajavatta	Peel of bark		Peel of <i>Macarangapeltata</i> and <i>Thespesiapopulnea</i> boiled in water, this water is taken in.
Malvaceae	<i>Thespesia populnea</i>	Poovarasu	Peel	Wound	
Asteraceae	<i>Ayapana triplinervis</i>	Mridhasanjeevani	Leaf	Piles/Hemorrhoids	Taken in one leaf each of Ayapana for about twenty-one days properly. Leaf grinded and taken in a small cloth and rounded into a small ball and inserted into the anus.
Leguminose	<i>Pithecellobium dulce</i>	Kodukkalachi /Makkanga	Seed	Pain during the time of delivery	1) The seed is roasted in a fire, powdered, and given to the pregnant lady. 2) Also the seed can be steam cooked in water and drunken the water. It

					should be only up to a particular dose or else it will affect the baby.
Asparagaceae	<i>Asparagus racemosus</i>	Sathavari	Tuber	White discharge in girls	Tuber and cowmilk are grinded and mixed well and drank in the early morning.
Nyctaginaceae	<i>Boerhavia diffusa</i>	Thazhuthaama	Root	Pressure	Boiled the root in water and drank that water.
Nyctaginaceae	<i>Boerhavia diffusa</i>	Thazhuthaama	Leaf	Swelling/ Cough and cold for pregnant ladies.	Grind the leaf and apply. For cough, it is taken in.
Lauraceae	<i>Cinnamontamala</i>	Idanam Edana	Leaf	Vomiting during Pregnancy	Prepare curry of leaf and eat.
Malvaceae	<i>Helicteres isora</i>	Idampiri valampiri	Seed	Body pain	Oil from the seed applied to the body gives relief from body pain.
Acanthaceae	<i>Justicia adhatoda</i>	Aadalodakam	Root	When delivery becomes late	The root is grinded and applied to the abdomen under the stomach.
Menispermaceae	<i>Tinospora cordifolia</i>	Amruthu	Stem	Diabetics	The stem is grinded using water, and the juice is filtered and drunk in the early morning 2-3 hours before food, continue this for about 10-15 days.
Apocyanaceae	<i>Alstonia venenata</i>	Analivegam	Leaf, Bark	Snake, Centipede, Dog Bite	Leaf paste applied on the bitten area gives relief from swelling and pain. Bark juice is applied to the area. It can be also taken orally by mixing in goat milk.
Costaceae	<i>Chamaecostus cuspidatus</i>	Insulin plant	Leaf	Diabetics	Take two leaves twice daily for one week, and in the second turn take one leaf twice a day for three weeks. Boiled the leaf in water and drunken
Capparaceae	<i>Maerua oblongifolia</i>	Perum Kurumba	Tuber	Gonorrhea, Cough, Stomach pain.	Tuber is grinded and the paste is mixed with milk and taken in. Tuber powdered and mixed with honey and taken orally which gives relief for cough and stomach ache.
Asteraceae	<i>Emilia sonchifolia</i>	Muyal cheviyan	Leaf	Tonsil	Leaf paste is applied externally over the throat and also orally taken.
Apocyanaceae	<i>Wrightia tictoria</i> (Roxb.) R. Br.	Dhandhapaala	Leaf	Psoriasis	Leaf torn into small pieces and taken in a clay pot. Added coconut oil, and kept this in sunlight for about seven days, on the eighth day filter the oil, which is externally applied on the skin.
Fabaceae	<i>Clitoria ternatea</i>	Sankupushpam (Violet)	Flower	1) Menstrual bleeding 2) Body pain	1) 1g flower paste mixed in honey and taken thrice a day 2) Flower is boiled in water and drunken.
Fungi: Ganodermataceae	<i>Ganoderma</i>	Urumakumman	Whole plant	Mumps	The whole plant is made into a paste and taken in.
Fabaceae	<i>Pseudarthria viscida</i>	Moovila	Whole plant	Urinary stones, Diabetics	Whole plant paste is taken orally.
Rutaceae	<i>Ruta graveolens</i>	Aroodha	Leaf and stem	Fever in small children's/To avoid fear among small infants	Leaf and stem juice mixed with Honey and taken in

Hypoxidaceae	<i>Curculigo orchioides</i>	Nilappana	Tuber	1) Urinary problems 2) Increasing lactation 3) Easy Childbirth	1) Grind the tuber mix with milk and take it orally. 2) Fresh tubers are eaten, and tuber paste is applied to the breasts of the mother. 3) Paste of rhizome applied on the lower part of the belly.
Apocyanaceae	<i>Hemidesmus indicus</i>	Naruneendi	Root	Stomach problems/ Jaundice	The root boiled in water and drank it.
Marantaceae	<i>Maranta arundinaceae</i>	Vella Koova	Tuber	Urinary retention	2-3 Tuber grinded and the paste mixed with 1-liter water and drunken it.
Cannbaceae	<i>Cannabis sativa</i>	Kanjaavu	1)Flower 2)Leaf	Snake Bite	Suddenly after the snake bite, smoked Cannabis flower (it is a drug) Leaf boiled in water and drunken.
Asteraceae	<i>Elephantocarpus scaber</i>	Aanachuvadi	Whole plant	Swellings/Inflammat ion	Whole plant paste is applied to the region.
Nyctaginaceae	<i>Mirabilis jalapa</i>	Naalumani chedi	Flower seed	Tiredness	Steam cooks the seed, open the covering, and eat.
Solanaceae	<i>Solanum ptychanthum</i>	Kaatuthakkali	Fruit	Tiredness	Fruit steam cooked and drinks that water.
Cycadaceae	<i>Cycas circinalis</i>	Eendhu	Seeds	1) Wound caused by thrones of the same plant. 2) Food for remaining healthy.	1) Seed is grinded and the paste is applied to the wound. 2) Crack the hard outer shell, split the seeds into two, soak them in water overnight, and dry under the sun for 3 days. Alternatively, powder it and make food items like Puttu, Eanthu kanji, etc.
Fabaceae	<i>Desmodium triflorum</i>	Nilam paranda	Leaf	Jaundice	Grinded, mixed with milk and taken in.
Malvaceae	<i>Abutilon indicum</i> (White)	Vella oorakam/Ooram	Whole plant	Typhoid	The whole plant is cut into pieces and kept in a dish. Drunken the water During the treatment food called "Podiyarikanji" has to be taken.
Asteraceae	<i>Chromolaena odorata</i>	Communist Pacha	Leaf	Wound	Leaf paste was applied to the wound.
Polygonaceae	<i>Polygonum chinense</i>	Mudandhi	Young leaves	1) To remain healthy (They say to avoid English medicines) 2) Contraction of uterus	1) Young leaves of <i>Polygonum chinense</i> and <i>Lagerstroemia macrocarpa</i> , both are chewed nicely and taken. 2) Stem is given orally.
Zingiberaceae	<i>Curcuma longa</i>	Pachamanjal	Rhizome	Centipede Bite	Rhizome and leaves of <i>Azadirachta indica</i> are grinded and applied to the bitten area.
Apocyanaceae	<i>Gymnema Sylvestre</i>	Chakkarakolli	Leaves	Constipation	Leaves were grinded and added a drop of water, mixed well, and drunken.
Rubiaceae	<i>Mussaenda belilla</i>	Vellilathaali	Leaves	1) Lactation problems in young mothers 2) Body pain	1) Leaves are grinded and given. 2) Leaves boiled in water along with <i>Eucalyptus globulus</i> to bathe
Verbanaceae	<i>Vitex altissima</i>	Mayilellu	Bark/ Wood	Bathing after delivery	Roots and bark boil in water, and women have to take baths in that water.
Liliaceae	<i>Gloriosa superba</i>	Menthonni	Rhizome	Gonorrhea/Fever	Rhizome starch is given.



Amaranthaceae	<i>Achyranthes aspera</i> L.	VanKadaladi	Leaves	Constipation /Renal Complications	Leaf paste is given orally.
---------------	------------------------------	-------------	--------	-----------------------------------------	-----------------------------

Table 2. Medicinal plants used by Urali tribes

Family	Binomial Name	Local Name	Part Used	Disease Cured	Method of Preparation
Liliaceae	<i>Aloe vera</i>	Kattarvazha	Fleshy leaf	For Easy Delivery	The leaf is chopped and given to women before 2 days of delivery for easy delivery.
Liliaceae	<i>Asperagus racemosus</i>	Sathavari	Tuber	Body pain	Tubers Are collected fresh and made into paste without using water. This paste is applied for body pain.5-10ml of juice is given twice for 3 weeks after delivery as Galactagogue.
Meliaceae	<i>Azadiracta indica</i>	Aaryaveppu	Bark	Excessive menstrual bleeding	Ground with water and added 100 ml in 100ml of buttermilk and consumed.
Cannabaceae	<i>Cannabis sativa</i>	Kanjavu	Leaves	Pain killer during delivery	Leaves are grinded and taken in.
Caricaceae	<i>Carica papaya</i>	Oma	Root	To induce abortion	10 cm long root of male plant soaked in 1 liter of water and made decoction, mixed with 1 spoon of charred elephant dung and consumed 3 times a day.
Caesalpiniaceae	<i>Cassia fistula</i>	Kanikonna	Bark	Stomach ache	The bark is grinded using water and taken in.
Asclepidaceae	<i>Calotropis gigantea</i>	Erikku	Flower	Snake bite, dog bite, Centipede bite	Flower is grinded and applied to the bitten region
Asteraceae	<i>Elephantopus scaber</i>	Aanachuvadi	Root	Wound	Root paste is applied externally on the wound.
Apocyanaceae	<i>Plumeria rubra</i>	Kaatu chembakam	Bark	Skin disease	Bark paste is applied to the affected part of the skin.
Lamiaceae	<i>Leucas zeylanica</i>	Thumba	Whole plant	Migraine	Whole plant paste is applied on the forehead.
Zingiberaceae	<i>Kaempferia galanga</i>	Kacholam	Rhizome	Sinusitis	Paste of Kaempferia galanga and Allium cepa are taken in.
Fabaceae	<i>Mimosa pudica</i>	Thottavadi	leaf	Diabetics	Leaf paste is taken in before sunrise.
Myristicaceae	<i>Myristica fragrance</i>	Jaadhikya	Fruit	Diarrhea	Fruit paste is mixed in honey and taken in.
Amaranthaceae	<i>Cyathula prostrate</i>	Kadalaadi	Whole plant	When delivery is delayed	Whole plant paste is applied over the abdomen.
Zingiberaceae	<i>Curcuma longa</i>	Manjal	Rhizome	Wound in umbilical code	Dried rhizome powder and cotton cloth ash are mixed with coconut oil and applied to the wound.
Malvaceae	<i>Hibiscus rosa-sinensis</i>	Chembarathi	Flower	Excessive menstrual bleeding	Flowers are eaten raw.
Piperaceae	<i>Piper longum</i> L.	Kattuthipalli	Seed and spike	Throat pain/ Toothache	Seed and spike paste is used for throat pain and fever. Spike is chewed against toothache.
Plumbaginaceae	<i>Plumbago zeylanica</i>	Koduveli	Root	To induce abortion	3-5 ml root paste taken orally.
Plumbaginaceae	<i>Plumbago zeylanica</i>	Koduveli	Tuber	Removal of placenta and contraction of uterus after delivery.	Juice of tuber is taken in.
Apiaceae	<i>Centella Asiatica</i>	Kodakan	Whole plant	Stomach disorders	Whole plant paste is taken internally.

Solanaceae	<i>Capsicum frutescens</i>	Kaandhari	Fruits	To clean the uterus after Delivery	Fruit mixed with dried coconut and prepare chutney and eat.
Fabaceae	<i>Clitoria ternatea</i>	Sangupushpam (White)	Root	Brain Development	3 g root paste mixed with ghee and taken early morning.
Acanthaceae	<i>Justicia gendarussa</i>	Vaadhamkolli	Leaf	Rheumatism	Leaves of <i>Hydrocotyle javanica</i> , <i>Justicia gendarussa</i> , and <i>Pterospermum rubiginosum</i> are grinded and the decoction is applied.
Solanaceae	<i>Datura metal</i>	Ummam	Leaf	Body pain	Leaves of <i>Datura metal</i> along with leaves of <i>Vitex negundo</i> and <i>Ricinus communis</i> are boiled and taken bath in it.

Table 3. Medicinal plants used by Paliyan tribes

Family	Binomial Name	Local Name	Part Used	Disease Cured	Method of Preparation
Amaranthaceae	<i>Achyranthes aspera</i>	Vankadalaadi	The whole plant, leaf	Fever/Cough among Children's	The decoction of the whole plant is used to take a bath. Leaves are eaten directly eaten to cure fever. The extract is taken from 100g of leaves and given against cough and fever.
Zingiberaceae	<i>Alpinia calcarata</i>	Chittaratha	Root	Fever	Root paste is taken in.
Amaranthaceae	<i>Aerva lanata</i>	Cherula	Leaf	Cold and cough	Leaf juice is taken orally twice a day for 3 days.
Mimosaceae	<i>Mimosa pudica</i>	Thottavaadi	Whole plant	Wound	Whole plant paste is applied externally to arrest bleeding.
Lauraceae	<i>Persea macrantha</i>	Kulamavaavu	Stem bark	Joint dislocation	Bark paste is applied externally over joints till the juice gets evaporated.
Lamiaceae	<i>Plectranthus amboinicus</i>	Panikoorka	Whole plant	Fever	Whole plant decoction is taken externally thrice a day for 2 days
Fabaceae	<i>Pterocarpus marsupium</i>	Venga	Wood	Diabetics	Dried heartwood decoction is taken internally thrice a day for 2 weeks.
Piperaceae	<i>Piper nigrum</i>	Kurumulaku	Seed	Cold, cough/ Fever	Seed powder is used with ginger against colds and coughs. Seed powder with <i>Ocimum sanctum L.</i> is used to cure fever and headache.
Zingiberaceae	<i>Zingiber officinale</i>	Inji	Rhizome	Asthma	The rhizome, pepper powder, turmeric powder, and sugar are boiled in milk and taken orally when it is warm.
Scrophulariaceae	<i>Scorpioides dulcis</i>	Kallurukki	Whole plant	Swelling/ Kidney stone	Whole plant paste mixed with 1 cup of boiled milk and taken internally for one month.
Sterculiaceae	<i>Helicteres isora</i>	Idampiri valampiri	Tender leaf	Itching of foot	Tender leaf paste, Charcoal, and salt were applied externally
Solanaceae	<i>Solanum ptychanthum</i>	Kaatuthakkali	Fresh leaves	To stop menstruation temporarily	Juice of fresh leaves folded and placed over the flame for some time is orally given to ladies.
Myrsinaceae	<i>Myristica fragrans</i>	Jaadhikya	Seeds	Improve digestion	Seed powder mixed with milk and given orally.

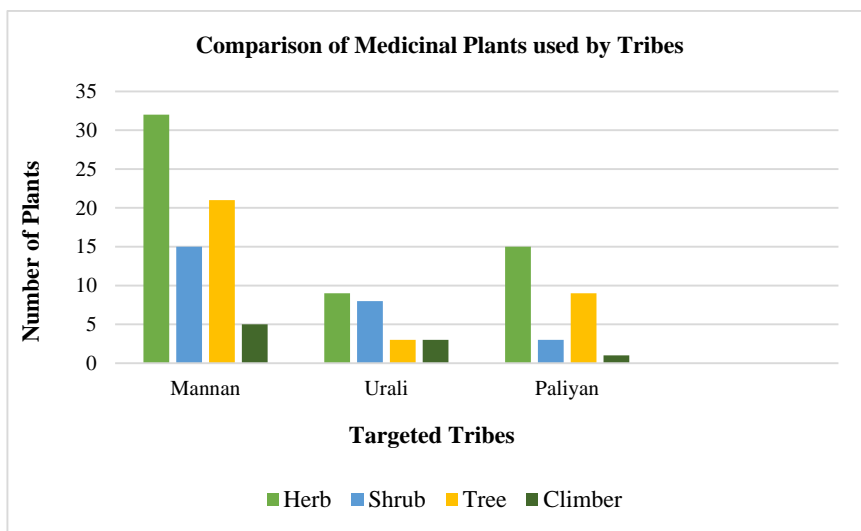
Aracaceae	<i>Colocasia esculenta</i>	Chembu	Tuber	Hair growth	Tuber juice is rubbed on the scalp for good hair growth.
Solanaceae	<i>Solanum torvum</i>	Chunda	Fruits	Enlargement of spleen	Fruit infusion is taken orally.
Liliaceae	<i>Asparagus racemoses</i>	Sadhaavari	Tuber	To increase lactation in animals	Decoction of about 10 gm of tuber is given to animals for a week.
Euphorbiaceae	<i>Phyllanthus amarus</i>	Keezhanelli	Whole plant	Jaundice	Paste is taken 3 times a day.
Crassulaceae	<i>Kalanchoe laciniata</i>	Ilamulachi	Leaf	Joint pain	Leaf extract was applied externally.
Verbanaceae	<i>Vitex negundo</i>	Karinachi	Leaf	1) Cold and Cough 2) Inflammation due to arthritis	1) Boiled with water and take steam inhale the vapors. 2) Leaf paste is applied to the swollen region.
Combretaceae	<i>Terminalia chebula</i>	Kadukka	Bark	Gastro-intestinal disorders	5 ml Decoction taken internally for about 1 week
Cesalpiniaceae	<i>Cassia fistula</i>	Kanikonna	Leaves	Leprosy	Leaf paste was applied to the affected area.
Flacourtiaceae	<i>Casearia elliptica</i>	Cherukanali	Leaves	Fish poison	Milky juice mixed with water and taken.
Apocyanaceae	<i>Plumeria rubra</i>	Kattuchembakam	Leaf	Skin diseases	Leaf paste applied externally.
Asparagaceae	<i>Sansevieria roxburghiana</i>	Muramachi/Kaithaala	Leaf	To avoid snakes	The belief of planting this keeps the snakes off the home.
Brassicaceae	<i>Brassica nigra(L)</i>	Kaduku	Seed	Fever/Cough	Seed paste was given.
Moringaceae	<i>Moringa oleifera</i>	Muringa	Leaf	Reduce Blood Pressure	Leaf grinded and the leaf juice taken in
Achariaceae	<i>Hydnocarpus pentandrus</i>	Marotti	Seed	They believe it increases their lifetime.	Seed oil is taken orally.
Meliaceae	<i>Naregamia alata</i>	Neelanaragam	Leaves	Migraine	Grinded half-glass leaf paste mixed with coconut oil and applied to the forehead.
Rutaceae	<i>Glycosmis pentaphylla</i> Corr.	Paanal	Fruit	Body pain/Tonsil	Eat fruit regularly

**Table 4.** Analysis of plant parts used as medicines by targeted tribes in terms of percentage

Plant Part Used			
	Mannan	Urali	Paliyan
Leaf	35	5	12
Root	5	4	1
Stem	4	-	-
Flower	4	2	-
Tuber	5	2	2
Rhizome	6	3	1
Bark	11	3	2
Seed	7	1	4
Latex	5	-	-
Whole plant	6	3	5
Fruit	4	2	1

Analysis of plant parts used as medicines by targeted tribes in terms of percentage is given in **Table 4**, it was observed that the mostly used plant part was leaves (52%), followed by roots (29%), stem, and bark (20%) Fruit and seed (19%), Whole plant (14%) Latex and resin (5%), flower and other parts (6%).

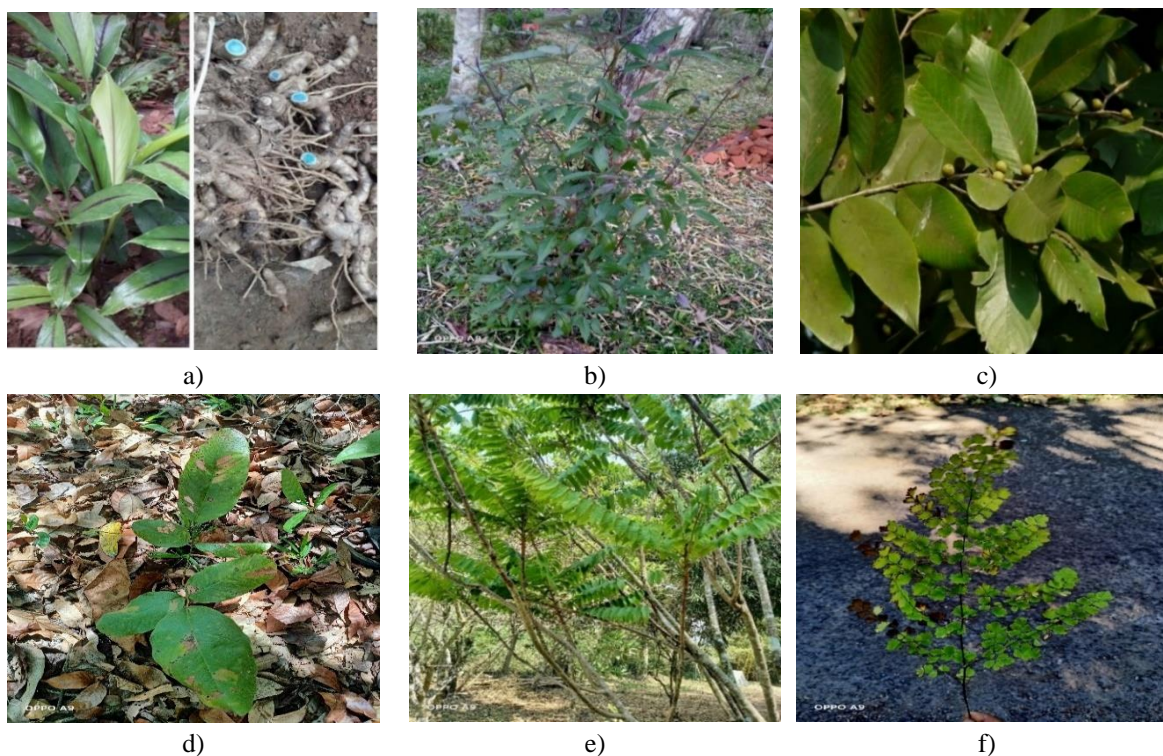
Among the plants used by the Mannan tribe, mostly used plant part was the leaf (35%) followed by root parts (16%), stem and bark (15%), Fruit and seed (11%), whole plant (6%), Latex and resin (5%), flower and other parts (4%). In the study of Urali tribes the mostly used plant part was root parts (9%) followed by Leaf (5%), seed and fruit (3%), Bark (3%), Whole plant (3%), and flower (2%). From Paliyan, the most used plant part is leaf (12%), followed by Whole plant (5%), seed (5%) and Root parts (4%).



**Figure 3.** Comparison of medicinal plants used by tribes

During the comparison of medicinal plants represented in **Figure 3**, used by different tribal groups, it was observed that the most used plants were Herbs (42%) followed by shrubs (23%), climbers (12%), and trees (25%). Mannas mostly use herbs (32%) as their medicine followed by Trees (21%) also shrubs (15%) and climbers (5%). Urali tribes use Herbs (9%), shrubs (8%), climbers, and trees 3% each. Paliyan tribes mostly use Herbs (15%), followed by trees (9%), Shrubs (3%), and climbers (1%).

Medicinal plants used by Mannan tribes are presented in **Figure 4**.







g)



h)



i)



j)



k)



l)



m)



n)



o)



p)



q)



r)



s)



t)



u)





v)



w)



x)



y)



z)



a\*)



b\*)



c\*)



d\*)



e\*)



f\*)



g\*)



h\*)



i\*)



j\*)





k\*)



l\*)



m\*)



n\*)



o\*)



p\*)



q\*)



r\*)



s\*)



t\*)



u\*)



v\*)



w\*)



x\*)



y\*)





z\*)



a\*\*)



b\*\*)



c\*\*)



d\*\*)



e\*\*)



f\*\*)



g\*\*)



h\*\*)



i\*\*)



j\*\*)



k\*\*)



l\*\*)

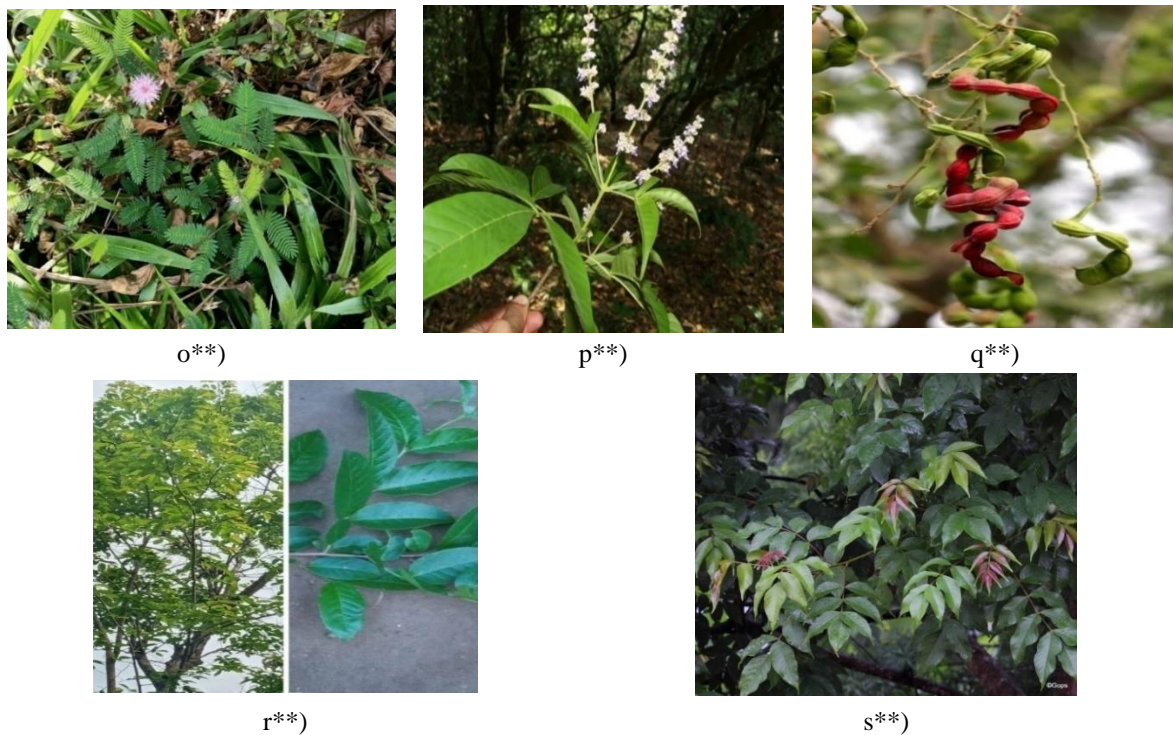


m\*\*)



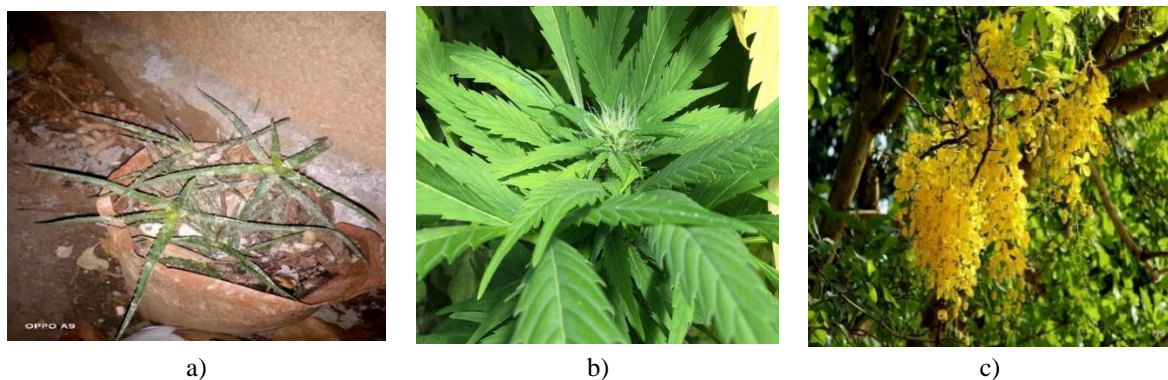
n\*\*)





**Figure 4.** Medicinal plants used by Mannan tribes. a) *Curcuma aeruginosa*, b) *Vitex negundo*, c) *Bridelia retusa*, d) *Pterocarpous marsupium*, e) *Tabernaemontana alternifolia*, f) *Adiantum raddianum*, g) *Lagerstroemia microcarpa*, h) *Averrhoa bilimbi*, i) *Argyreia nervosa*, j) *Sida alnifolia*, k) *Breynia vitis-idaea*, l) *Ziziphus rugose*, m) *Cinnamomum tamala*, n) *Perseamacrantha*, o) *Phyllanthus maderaspatensis*, p) *Scoparia dulcis*, q) *Grewia tiliifolia*, r) *Ocimum tenuiflorum*, s) *Azadirachta indica*, t) *Curcuma longa*, u) *Lagerstroemia speciose*, v) *Carica papaya*, w) *Hemigraphis colorata*, x) *Macaranga peltata*, y) *Careya arborea*, z) *Persicaria sp.*, a\*) *Kalanchoe gastonis-bonnier*, b\*) *Naravelia zeylanica*, c\*) *Eucalyptus globules*, d\*) *Physalis angulate*, e\*) *Zingiber officinale*, f\*) *Citrus lemon*, g\*) *Macrotyloma uniflorum*, h\*) *Tabernaemontana divaricate*, i\*) *Calotropis gigantean*, j\*) *Eclipta prostrata*, k\*) *Cissyl quadrangularis*, l\*) *Thespesia populnea*, m\*) *Ayapana triplinervis*, n\*) *Asparagus racemosus*, o\*) *Boerhaavia diffusa*, p\*) *Helicteres isora*, q\*) *Justicia adhatoda*, r\*) *Tinospora cordifolia*, s\*) *Alstonia venenata*, t\*) *Chamaecostus cuspidatus*, u\*) *Maerua oblongifolia*, v\*) *Emilia sonchifolia*, w\*) *Wrightia tinctoria*, x\*) *Clitoria ternatea*, y\*) *Ruta graveolens*, z\*) *Curculigo orchioides*, a\*\*) *Hemidesmus indicus*, b\*\*) *Maranta arundinacea*, c\*\*) *Cannabis sativa*, d\*\*) *Elephantopus scaber*, e\*\*) *Mirabilis jalapa*, f\*\*) *Solanum ptychanthum*, g\*\*) *Cycas circinalis*, h\*\*) *Desmodium triflorum*, i\*\*) *Abutilon indicum*, j\*\*) *Chromolaena odorata*, k\*\*) *Polygonum chinense*, l\*\*) *Gymnema sylvestre*, m\*\*) *Mussaenda bellila*, n\*\*) *Gloriosa superba*, o\*\*) *Mimosa pudica*, p\*\*) *Vitex altissima*, q\*\*) *Pithecellobium dulce*, r\*\*) *Fraxinus sp.*, and s\*\*) *Lannea coromandelica*

Medicinal plants used by Urali tribes are presented in **Figure 5**.







d)



e)



f)



g)



h)



i)



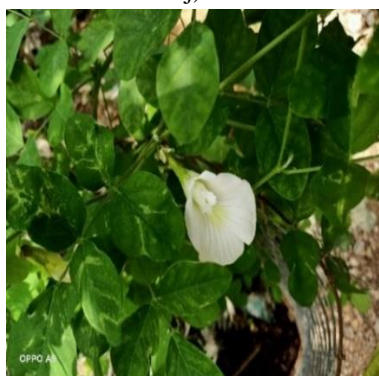
j)



k)



l)



m)



n)



o)





p)

**Figure 5.** Medicinal plants used by Urali tribes. a) *Aloe vera*, b) *Cannabis sativa*, c) *Cassia fistula*, d) *Carica papaya*, e) *Leucas aspera*, f) *Kaempferia galangal*, g) *Myristica fragrance*, h) *Hibiscus rosa-sinensis*, i) *Piper longum*, j) *Plumbago auriculata*, k) *Centella asiatica*, l) *Capsicum frutescens*, m) *Clitoria ternatea*, n) *Justicia gendarussa*, o) *Datura stramonium*, and p) *Cyathula prostrata*

Medicinal plants used by Paliyan tribes are presented in **Figure 6**.



a)



b)



c)



d)



e)



f)



g)



h)



i)





**Figure 6.** Medicinal plants used by Paliyan tribes. a) *Colocasia esculenta*, b) *Alpinia calcarta*, c) *Aerva lanata*, d) *Zingiber officinale*, e) *Plectranthus amboinicus*, f) *Piper nigrum*, g) *Solanum torvum*, h) *Kalanchoe lacinata*, i) *Casearia elliptica*, j) *Terminalia chebula*, k) *Brassica nigra* (L.), l) *Moringa oleifera*, m) *Sansevieria roxburghiana*, n) *Hydnocarpus pentandrus*, o) *Naragamia alata*, and p) *Glycosmis pentaphylla*

Medicinal plants have great importance to the health of individuals and communities due to their significant biological activities [7]. For the present study of Mannan tribes, 44 informants (31 males, 13 females) in the age group of 45-83 years were contacted for data collection and it was observed that the mostly used plants among the mannans are *Vitex negundo*, *Mimosa pudica*, *Cinnamomum tamala*, *Curculigo orchiodes*, *Kalanchoe gastonis bonnieri*, *Persea macrantha*, *Scoparia dulcis*, *Curcuma longa*, *Curcuma aeruginosa*. During the survey, it was observed that some plants are used alone while some are in combination with other plants. Tribal practitioners use specific plant parts and specific dosages for the treatment of diseases and the dose given to the patient depends on age, physical status, and health conditions. A similar observation was made by Tresina *et al.* [8].

Several traditional medicinal plants were used by the local people for the treatment of diabetics. The plant parts such as seeds, leaves, stems, and bark are used by the local people similar observation was recorded by Mustafa *et al.* [9]. *Mimosa pudica* possesses many medicinal properties and was used by the three tribal groups for various treatments. *Azadirachta indica* was used to cure various ailments like fever, cold, anti-inflammatory, anti-malarial activity, Asthma, Ulcer, etc. due to the presence of secondary metabolites like Azadirachtin, Nimbidin, etc., similar results have been documented by Uddin *et al.* [10].

*Pithecellobium dulce* was used as a pain killer during the time of childbirth by the Mannan community [11]. Also reported that this plant possesses antioxidant, anti-inflammatory, anti-diabetic, and anti-cancer properties. It provides relief from pain, eczema, fever, cold, sore throat, pigmentation, acne, and pimples. Some special methods are being followed by the Mannans in collecting 'touch me not' (Thottavadi). Traditionally the sliced root of

'Thottavadi' is procured from the plant without making any sort of noise and in a silent manner. This is then boiled and the water so obtained is useful in the treatment of acute piles. Of the investigated plant species viz. *Piper longum*, *Pseudarthria viscid* and *Gloriosa superba* are enlisted in the Red List Status of IUCN. A similar observation was made by Rogimon and George [12].

Mostly plants with latex were used to treat various skin disorders like Vitiligo i.e., plants belonging to families like *Apocyanaceae*, *Euphorbiaceae*, etc. The tribals place their medicinal plants in their work shop place and pray before they start the treatment. They are reluctant to share the complete information of the treatment because they are afraid of the thought if they share their medicinal knowledge the treatment won't be successful, and also, they are afraid of the misuse of this knowledge.

In the study of Urali tribes 30 informants (12 male, 18 female) in the age group of 43-70 were contacted and observed that nine plants were used for seven Gynecological Treatments such as menstrual bleeding, pain during delivery, abortion, wound in the umbilical cord when delivery delayed, removal of placenta, clean uterus [13] also reported that 29 plant species belonging to 22 families are being used by Uralis against various Gynecological treatments. The critical evaluation of the literature gives an insight into the utilization of some of the plants that are well-recognized in gynecological treatments among various tribal communities [14]. Knowledge of medicinal plants now seems to be confined to older people only (above 50 age). The younger generation is ignorant about the vast medicinal resources available in their surroundings and is more inclined towards market resources. A similar result was observed by Wassie [15].

Families such as *Acanthaceae*, *Asclepidaceae*, *Euphorbiaceae*, and *Solanaceae* were most frequently used for the treatment of various ailments by Urali tribes. The most used plant parts were roots and leaves followed by bark, whole plant, flower, stem, and latex. A similar result was also recorded by Bhattacharjee *et al.* [16]. Leaves of *Justicia adathoda* and its roots were used to treat rheumatism and painful inflammatory swellings. A similar result was also recorded by Jose *et al.* [17].

For the study of Paliyan tribes 24 informants (13 male, 11 female) in the age group of 48-80 were contacted and observed Nineteen plants used for Fifteen different ailments. The Paliyan tribe is hesitant to disclose most of the information since they have a strong belief that if they share their knowledge about medicinal plants, the effect of treatment becomes lost, A Similar observation was made by Ninkova *et al.* [18]. Information on *Cassia fistula*, *Hemidesmus indicus*, and *Butea monosperma* is found to be new in this area when compared with the available literature on Indian Medicinal plants [19]. Recorded the same result. *Vitex negundo* plant was effective against inflammation due to arthritis. A similar result was recorded by Jose *et al.* [17].

## CONCLUSION

The present study reveals that the local healthcare practices of the Mannan tribe in the Idukki district are very significant. They possess good knowledge of herbal drugs when compared with the other two communities i.e., Urali and Paliyan. In general, medicines are prepared in the form of juice/extract followed by infusion, powder, decoction, or paste to cure various diseases like vitiligo, gynecological problems, wound, jaundice, cough/cold, typhoid, kidney problems, snakebite, skin problems, anemia, urinary tract infections, worm infections, filariasis, body pain, diabetics, arthritis, haemmeroids, headache, etc. Different plant parts such as roots, leaves, stems, flowers, fruits, seeds, tubers, rhizomes, and at certain conditions, whole plants were used as medicine. Mostly *Apocyanaceae*, *Zingiberaceae*, and *Fabaceae* had the largest number of plants collected. Some of the medicinal plants are easily available where as the majority of them were collected from Kovilmala Forest. Some of the psychosomatic cases and diseases like fever/cold/cough are mostly cured by magico-religious practices along with some herbal medicines. The tribals are also involved in honey collection. The treatment duration depends upon the age and health condition of the patient.

**ACKNOWLEDGMENTS:** The authors express sincere thanks to the head of the Department of Biology, School of Science, Gandhigram Rural Institute - Deemed to be University, Dindigul, Tamil Nadu, India, and Institute of Modern Facility Fisheries, College of Biology and Oceanography, Weifang University, Weifang 261061, China for the facilities provided to carry out this research work.

**CONFLICT OF INTEREST:** None

**FINANCIAL SUPPORT:** None

**ETHICS STATEMENT:** None

## REFERENCES

1. Ralte L, Sailo H, Singh YT. Ethnobotanical study of medicinal plants used by the indigenous community of the western region of Mizoram, India. *J Ethnobiol Ethnomed.* 2024;20(1):2. doi:10.1186/s13002-023-00642-z
2. Purushothaman T, Mol KI. Ethnobotanical medicines used by the Kani and Kurichiyar tribal communities of Kerala. *Shanlax Int J Arts Sci Humanities.* 2020;8(1):191-9.
3. Census of India. Basic Data Sheet. District Wayanad, Kerala. 2011.
4. Mondal S, Ghosh S, Biswas R, Bhattacharya S. A review on health-seeking behavior and reliance on traditional & complementary medicine (T&CM) among tribal population of India. *Int J Health Clin Res.* 2021;4(17):133-6.
5. Bordoloi C, Kumar S, Barbhuiya AM, Kushari S, Kalita JM, Sahu BP, et al. Herbal medicine used for wound healing by the tribes of the northeastern states of India: A comprehensive review. *J Herb Med.* 2023;41:100697. doi:10.1016/j.hermed.2023.100697
6. Rajasekharan S, Nair VT, Navas M, James TC, Murugan K. Traditional knowledge and its sustainable utilization. In: Sukumaran, S. T., T R, K. (eds) *Conservation and sustainable utilization of bioresources. Sustainable Development and Biodiversity 2023* (pp. 597-657). Singapore: Springer. doi:10.1007/978-981-19-5841-0\_25
7. Mohamed AA, Alotaibi BM. Essential oils of some medicinal plants and their biological activities: A mini-review. *J Umm Al-Qura Univ Appl Sci.* 2023;9(1):40-9. doi:10.1007/s43994-022-00018-1
8. Tresina PS, Selvam MS, Sornalakshmi V, Mohan VR. An ethnobotanical study of medicinal plants used by traditional healers in grizzled squirrel wildlife sanctuary (GSWS) Tamil Nadu, India. In: *Bioprospecting of Tropical Medicinal Plants 2023* (pp. 43-106). Cham: Springer Nature Switzerland. doi:10.1007/978-3-031-28780-0\_3
9. Mustafa A, Hanif U, Sardar AA, Jan HA. Ethnomedicinal study of medicinal plants used by the population of Taunsa Sharif, Dera Ghazi Khan, Punjab, Pakistan. *Ethnobot Res Appl.* 2023;26:1-27.
10. Uddin MS, Nuri ZN, Khorshed M. Neem (*Azadirachta indica*) in health care: A review. *Int J Unani Integ Med.* 2018;2(2):81-7.
11. Kumar T, Alam MS, Malik R, Gautam GK, Nimesh S. Cosmeceutical current review of herbal plants used for skin diseases and related problems in India: An overview. *World J Pharm Res.* 2022;10(03):290-8. doi:10.54037/WJPS.2022.100307
12. Rogimon PT, George KV. Traditional botanical knowledge of Mannan tribes in Kovilimala. Kerala State. 2012. ISBN:978-93-5067-867-1.
13. Suthari S, Kota S, Kanneboyena O, Gul MZ, Abbagani S. Ethnobotanical perspectives in the treatment of communicable and noncommunicable diseases. In: *Phytomedicine 2021 Jan 1* (pp. 251-289). Academic Press. doi:10.1016/B978-0-12-824109-7.00016-9
14. Jan M, Khare RK, Mir TA. Medicinal plants used during pregnancy and childbirth in Baramulla district of Jammu and Kashmir, India. *Ethnobot Res Appl.* 2021;22:1-9.
15. Wassie SB. Natural resource degradation tendencies in Ethiopia: A review. *Environ Syst Res.* 2020;9(1):1-29. doi:10.1186/s40068-020-00194-1
16. Bhattacharjee T, Mahato G, Banerjee N. Exploration and documentation of ethnobotanicals used by traditional healers from Purulia district of West Bengal, India. *J Appl Pharm Sci.* 2024;14(03):199-208. doi:10.7324/JAPS.2024.148149
17. Jose AB, Priscilla N, Francis D. Antimicrobial, antioxidant, and anti-inflammatory activities of *Justicia adhatoda* L. leaf extract. *Med Plants-Int J Phytomed Relat Ind.* 2023;15(3):595-604. doi:10.5958/0975-6892.2023.00060.6
18. Ninkova V, Hays J, Lavi N, Ali A, da Silva Macedo SL, Davis HE, et al. Hunter-gatherer children at school: A view from the Global South. 2022. doi:10.31234/osf.io/zxq98
19. Sivaraj N, Venkateswaran K, Pandravada SR, Reddy MT, Rajasekharan PE. Threatened medicinal plants of Eastern Ghats and their conservation. In: *Conservation and utilization of threatened medicinal plants* (pp. 31-62). Springer, Cham. 2020.