A comparative note on the ethnomedicinal plants used by the Kattunaikka and Paniya tribes of Nilambur forest, Malappuram district, Kerala, (India)

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An ethnobotanical survey was conducted to explore the indigenous knowledge of the Kattunaikka and Paniya tribes of Nilambur forest, Malappuram District, Kerala, India and to highlight the uses of the diverse flora. This paper provides information about 79 medicinal plant species used by the two tribes to manage 38 ailments conditions, either as single plant remedies or in combination. Of the 79 species recorded, 64 species (81%) were found to be used in the Ayurvedic system of medicine and 65% for similar conditions. The indigenous knowledge of these tribal traditional healers has been disappearing due to lack of followers for this valuable knowledge, as well as their migration to places outside of the forest. Use of plants among the two tribes reflects their interest in ethno-medicine and further investigation on under-explored species may lead to the discovery of novel pharmaceutical products.

Key Words: Ayurveda; Ethnomedicine; Kattunaikka; Paniya; Nilambur forest

INTRODUCTION

The Indian subcontinent represents one of the greatest treasures of ethnomedical knowledge. Kerala state of India, at the southernmost boundary of the Malabar coast, has Western Ghats on the east and Arabian Sea on the west and has a land area of 38,863 Km². Malappuram district lies in northern Kerala and is bounded on the north by Wayanad and Kozhikode districts, on the northeast by Tamil Nadu state, on the southeast and south by Palakkad district, on the southwest by Thrissur district, on the west by the Arabian Sea and on the northwest by Kozhikode district. Nilambur, a municipality and a taluk in the Malappuram district, is situated close to the Nilgiris range of the Western Ghats on the banks of the Chaliyar river. Nilambur is inhabited by indigenous tribal groups. The scheduled tribes of Nilambur area are about 0.56% of the total population and it comes to 22,990 people. As per the 2011 census, the Kattunaikkan population was estimated at 1629 individuals, spread over 452 households. Out of the 35 scheduled tribes notified in the state, Paniyan is the most populous tribe with an estimated population of 81,940, forming 22.5% of the total tribal population of the state [1].

Ethnobotanists could play very useful roles in rescuing disappearing knowledge and returning it to local communities. Several wild medicinal plants are declining in number due to the destruction and unscientific collection of plants from forests. Except for the documentation of the ethnomedical knowledge in the Malappuram district by Thomas et al., [2-5] not much work is being done in this area. There is a very limited and scattered scientific record of the traditional medicines, used by the Kattunaikka and Paniya tribes of Malappuram district. The aim of this study was (1): To document the knowledge on ethnomedicines of Kattunaikka and Paniya tribes of Nilambur forest and (2): To find out whether traditional usages of medicinal plants by these tribes for treatment of various ailments has similarity with the uses in Ayurvedic medicine or the tribal medicinal usages of medicinal plants by these tribals for treatment of various ailments.

MATERIALS AND METHODS

Study area

The study was conducted in the Nilambur taluk of Malappuram district, Kerala (India), an area adjacent to the tropical mountain forests of Nilgiris, significant for floristic explorations. The valley is divided into three forest ranges, viz. the Nilambur range, Chingathara range and Karului range. Geographically, the area is located approximately between 11°26’N-11°9’N latitude and 75°48’E-76°33’E longitude with altitudes ranging from 50 to 2500 m Above Mean Sea Level (AMSL). Soil is largely loamy on the ghat, but at lower elevation it is lateritic. With an annual average rainfall of over 2500 mm, spread almost throughout the year, the climate is warm humid. The temperature ranges from 17°C to 37°C.

Ethnobotanical data collection

Several field visits were conducted between 2010 and 2016 in the study areas among the Kattunaika and Paniya tribes to collect information on medicinal plants used by them using a questionnaire survey, interviews with key informants (knowledgeable elders, religious leaders and other individuals) and field observations. Interviews and discussions were conducted in Malayalam (the local language) using a checklist of topics. At the beginning of each interview the aim of the interview was explained to invoke clear and objective responses and then informants were asked for their consent. A range of ethnobotanical information including local names, habitat and habitat, uses, parts used and mode of utilization of the plant were covered. Vegetation surveys and field observations were also conducted to substantiate these results. Vegetation surveys were carried out both in homesteads, in the wild and road sides to assess the distribution of the most frequently reported plant species. The collected specimens were cross-checked for their local names with the help of key informants and development agents. Botanical names were established by comparing specimens with those in the herbarium of Centre for Medicinal Plants Research (CMPR) and final identification was done after detailed laboratory studies, using stereomicroscopes and light microscopes or after consulting relevant floristic literature and their uses was carefully recorded in the field data book, Figure 1. The specimens are preserved in the CMPR herbarium. Medicinally important parts of some plants were collected and preserved in Formalin Acetic Acid (FAA) solution for further reference. Each species was checked for its Ayurvedic uses with the help of available literature like Ayurvedic pharmacopoeia of India and other books and similarity and dissimilarity in use were analysed [6].
RESULTS AND DISCUSSION

Level of knowledge about plant resources among the informants

The study revealed that the level of knowledge differs in extent among the two tribes, gender and age groups. Though not much difference was recorded between the two tribes in the number of plant species used and the number/nature of ailments mentioned by them, Paniya tribe possessed comparatively higher knowledge about ethno-botanically useful plants than the Kattunaikka in terms of number of species used for a particular ailment/condition (details on differences are mentioned under the section ethnobotanical uses). Similarly, male informants had more knowledge than women. Among the men, elders were more aware than the younger members of the community. The lack of availability of elderly informants was experienced during the study. Narayanan et al., [7] has conducted ethnobotanical studies in the Wayanadu district, Kerala and documented information on 165 edible plants used by Kattunaikka, Paniya and Kuruma tribes. They report that the Paniya tribal community possesses knowledge regarding 136 taxa of wild edible plants, with Kattunaikkas 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. The study supports our view that Paniya community of Nilambur area is rich in their knowledge on medicinal value of plants.

Taxonomic and ethanobotanical information

The present study documented taxonomical status and ethnobotanical usages of 79 plant species belonging to 76 genera and 45 families, used by the two tribes along with botanical name, family, vernacular name, plant parts used and mode of use (Tables 1-3). According to their life form, the greatest proportion of useful plants recorded at the locality included shrubs (32%), trees (29%), herbs (28%) and climbers (11%). The four most important families in terms of their number of taxa were Fabaceae with nine, Apocynaceae with seven, Asteraceae with five and Lamiaceae with four taxa. Two families were represented by three taxa each and nine families were represented by two taxa each. Rest of the 30 families consisted of only one taxa each. Use of plants for medicinal purpose by the two tribes from a wide variety of families was a point of interest.

Figure 1) Herbarium specimens of selected ethnomedicinal plants. (1): Pancratium triflorum Roxb.; (2): Calotropis gigantea (L.) Dried.; (3): Sanaca asoca (Roxb.) de Wilde.; (4): Cyclopa peltata (Lam.) Hook, f. and Thoms.; (5): Cassia fistula L.; (6): Indigofera tinctoria L.; (7): Elephantopus scaber L.; (8): Momordica charantia L.; (9): Catharanthus roseus (L.) G. Don.; (10): Rauwolfia serpentina (L.) Benth. ex Kurz.; (11): Piper longum L.; (12): Asparagus racemosus Willd.; (13): Emilia sonchifolia (L.) DC.; (14): Plumbago zeylanica L.; (15): Strychnos nuxvomica L.
A comparative note on the ethnomedicinal plants used by the Kattunaikka and Paniya tribes of Nilambur forest, Malappuram district, Kerala, (India)

**TABLE 1**

| S. no | Botanical name, family, local name, part used | Tribal use | Mode of administration | Ayurvedic uses | Similar (S)/Dissimilar (D) |
|-------|---------------------------------------------|------------|------------------------|---------------|-----------------------------|
| 1     | *Asparagus racemosus* Wild. / Asparagaceae, Satavari, tubers | Gynecological diseases | Tuber decoction twice a day for one month | Women health, galactagogue, rejuvenative | S |
| 2     | *Boerhavia diffusa* L. / Nyctaginaceae, Tazhuthama, whole plant | Cardiac disorders | Plant decoction is taken internally once a day for 5 weeks | Diuretic, heart tonic and jaundice | S |
| 3     | *Calycoperes floribunda* Lam / Combretaceae, Pullani, leaves | Skin diseases | Leaf paste external application | Skin diseases | S |
| 4     | *Cyca spicata* / Hypoxidaceae, Nellippaana, tubers | Piles | Root decoction is taken internally and root paste is applied externally | Aphrodisiac, appetizer, piles, fever and poisonous affections | S |
| 5     | *Cyca peltata* (Lam.) Hook.f. / Thoms. / Menispermaceae, Padakizhangu, roots | Postpartum health | Root decoction to improve body vigor and to retain health | Skin diseases and poisonous affections | D |
| 6     | *Datura stramonium* L. / Solanaceae, Vella ummam, fruit | Leprosy, skin diseases and dandruff | Crushed fruit paste is used externally. | Whooping cough, asthma, painful menstruation Leprosy, dandruff, skin diseases | S |
| 7     | *Elephantopus scaber* L. / Compositae, Anachuvadi, leaves | Child birth | Fresh leaves mixed with starch water decoction to deliver placenta especially animals | - | - |
| 8     | *Ficus exasperata* Vahl / Moraceae, Parakam, whole plant | Cuts and wounds | Whole plant is applied externally 4-5 times | Ulcer, intestinal worms, infertility, wounds and other skin problems | S |
| 9     | *Gliricidia sepium* L. / Acalypha, Menthol, rhizomes | Cancer | Tuber decoction is taken internally twice a day | Skin diseases, rheumatism and leprosy | S |
| 10    | *Hemidesmus indicus* R.B. var. / Apocynaceae, Nannari, roots | Refreshing drink | Root paste mixed with lime. Root used to make pickles | Rejuvenating drug, diuretic, digestive, blood diseases | S |
| 11    | *Holostemma adulationis* Schult. / Apocynaceae, Adapathian, roots | Postpartum vigor, eye diseases | Root decoction for youthful vigor, used against eye diseases | Eye diseases, Improves health and vigor | S |
| 12    | *Hydrocotyle pentandrus* (Buch.-Ham.) Oken / Acanthaceae, Marotti, seeds | Skin diseases and hair loss | Seed oil applied externally | Skin diseases, leprosy, inflammations, intestinal worms, wounds and ulcers | D |
| 13    | *Indigofera tinctoria* L. / Leguminosae, Neelaamari, whole plant | Skin diseases, jaundice, hair tonic | Whole plant, oil from leaf | Hair tonic, ascites, skin affections | S |
| 14    | *Lantana camara* var. / Vernexaceae, Kongini, flowers | Cuts and wounds | A paste made up of flowers is applied externally | - | - |
| 15    | *Narvelia zeylanica* (L.) DC. / Ranunculaceae, Vathamkodi, whole plant | Skin diseases, leprosy, inflammations, intestinal worms, wounds and ulcers | Plant decoction is used internally | - | - |
| 16    | *Pantridium triflorum* Roxb / Amaranthaceae, Kattu villu, bulbs | Achene foot diseases | Heated bulbous portion applied to affected area, repeat it for 7 days | Powerful stimulant, digestive, cardiac and respiratory problems | D |
| 17    | *Piper longum* L. / Piperaceae, Thippali, fruits and seeds | Joint pain | Root paste is applies on effected portion two times daily | - | - |
| 18    | *Plectranthus amboinicus* (Lour.) Spreng / Lamiaceae, Kannikooorka, leaves | Infantile fever | Leaf decoction is taken internally | Infantile cough, cold, fever | S |
| 19    | *Ricinus communis L.* / Euphorbiaceae, Avarakku, leaves, roots and seeds | Asthma, joint pain | A decoction made up of roots taken internally, seed oil for joint pain | Piles, cough, worm troubles, leprosy, colic, rheumatism | S |
| 20    | *Rotula aquatica* Lour. / Boraginaceae, Kallur vanchi, roots | Piles | Root decoction is taken internally and root paste applied externally | Piles, kidney and bladder stone, and uterine disorders. | S |
| 21    | *Schleichera oleosa* (Lour.) Oken / Sapindaceae, Poovam, seeds | Snake bite | Bark is crushed and applied externally | - | - |
| 22    | *Senna tora* (L.) Roxb. / Leguminosae, Pottakharam, leaves | Skin diseases | External application of leaf paste | Skin diseases | S |
| 23    | *Solanum violaceum* Ortega ssp. violaceum / Solanaceae, Puthirichunda, roots | Cardiac disorders | Root decoction is taken internally | Respiratory and cardiac disorders, skin ailments | S |
| 24    | *Wrightia tinctoria* (Roxb.) B. / Ayacucnaceae, Kutakakappa, Bark, seeds | Burning sensations | Seed oil is applied | Skin diseases, hair growth | D |
## TABLE 2
List of plant species used as single plant remedies by Kattunaikka tribes for various ailments/conditions

| S. no | Botanical name, family, local name, part used | Ailment/condition | Mode of administration | Ayurvedic uses | Similar (S)/Dissimilar (D) |
|-------|---------------------------------------------|------------------|------------------------|----------------|--------------------------|
| 1     | Aegle marmelos (L.) Corr. Rutaceae, Koovalam, leaves | Diabetes         | Leaf decoction twice a day for 3 months | Diabetes, diarrhoea and gastritis | S |
| 2     | Anamirta cocculus (L.) Wight & Arn. Menispermaeae, Kolliakaya, dry fruits | Skin diseases    | Water boiled with the dry fruits is used for bathing twice a day for one month | Skin diseases | S |
| 3     | Aristolochia indica L., Aristolochiaceae, Karalam, roots | Snake bite       | Root decoction is taken internally twice a day for 7 days | Snake poison, blood purifier, skin diseases | S |
| 4     | Azadirachta indica A. Juss., Meliaeaceae, Arayavepu, bark and leaves | Rheumatism       | Water boiled with bark and leaves of this plant are used for bathing once a day for 21 days | Rheumatism, skin diseases | S |
| 5     | Bacopa moneri (L.) Pennell, Plantaginaceae, Bhrami, whole plant | Epilepsy         | Whole plant decoction is taken internally twice a day for 2 months and also is used as a brain tonic | Epilepsy, improves memory, anti-aging, bronchitis, coughs, tonic for heart and nerves | S |
| 6     | Calotropis gigantea (L.) R.Br. Apocynaceae, Eriku, flowers | Asthma           | 10 ml of flower decoction is taken internally 2 times a day for one month | Asthma, promote digestion, piles, skin diseases | S |
| 7     | Cittoria tenuatea L. Leguminosae, Sankhupushpam, whole plant | Pilia            | Whole plant decoction is taken internally twice a day | Pilia, uterine disorders, skin and eye diseases | S |
| 8     | Cyclas cirinallis L. Cycadaceae, Eenthu, fruit | Postpartum health | Dried fruit is crushed and boiled with water and is consumed | - | - |
| 9     | Desmodium gangetium (L.) DC. Leguminosae, Onila, whole plant | Cardiac diseases | Root decoction is taken internally twice a day for 3 days | Cardiac disorders, burning sensations, fever and cough | S |
| 10    | Emilia sonchifolia (L.) DC. Compositae, Muyalchevi, roots and bark | Flatulence and colic | Mixed decoction of root and bark is taken internally | Colic, fever, tonsilitis and eye diseases | S |
| 11    | Euphorbia nivula Buch. Ham. Euphorbiaceae, Kallil, roots and leaves | Abdominal disorders | Decoction of roots and leaves mixed with starch water is taken internally | Stomachic, purgative, arborficient, jaundice | S |
| 12    | Gymnema sylvestre (Retz) R.Br. ex Schult., Apocynaceae, Chakkarakoli, roots and leaves | Diabetes         | Dried leaves and root decoction is taken internally twice a day for one month | Diabetes | S |
| 13    | Hemigraphis colorata (Blume) Half.f. Acanthaceae, Murikooti, leaves | Wounds           | Leaf paste is applied to affected portion | - | - |
| 14    | Ixora coccinea L. Rubiaceae, Thechi, whole plant | Dermatitis       | Whole plant paste is applied externally twice a day for 3 days | Skin affections like itches, scabies, boils etc. | S |
| 15    | Kalanchoe schweinfurthii Penzig, Crassulaceae, lamuluchi, leaves | Diarrhoea         | Leaf juice is taken internally once daily in 7 days | - | - |
| 16    | Melia azedarach L. Meliaeaceae, Malavepu, bark and leaves | Headache         | Bark and leaf paste external application | Eye and skin affections, catarrhal, leprosy | D |
| 17    | Mesua ferrea L. Calophylyaceae, Churuli, flowers and leaves | Postpartum health | Decoction made up of flower and leaf is taken internally twice daily for one month to improve body vigor and to retain health | Diseases of urinary bladder, sore throat, bronchitis, cough and constipation | D |
| 18    | Myristica malabarica Lam, Myristicaceae, Pathiri, seeds | Burning sensation | External application of seed paste for seven days | Burning sensation | S |
| 19    | Naringi crenulata (Roxb.) Nicolson Rutaceae, Kallu narakam, seeds | Hair tonic       | Oil from seeds is applied against hair loss | - | - |
| 20    | Nothapodytes nimmoniana (J. Graham) Mabb. icacinaceae, Peenari, heart wood | Epilepsy         | water boiled with heart wood is used for bathing | - | - |
| 21    | Nyctanthes arbor-tristis L. Oleaceae, Pavizhamulla, roots | Uterine disorders | Root decoction is taken internally twice a day | - | - |
| 22    | Oxalis corniculata L. Oxalidaceae, Puliyarlia, leaf | Vomiting         | Leaf paste along with starch water is taken internally twice a day for 2 days | Stomachic, digestive stimulant, skin problems | S |
| 23    | Plumbago zeylanica L. Plumbaginaceae, Vellakoduvell, roots | Bronchial asthma  | Root decoction is taken internally in empty stomach once daily in one month | Skin conditions, blood purifier | S |
| 24    | Premna serratiloba L. Lamiaceae, Munja, whole plant | Back pain and body pain | Whole plant decoction is taken internally once daily for two months | Rheumatism, cough, cardiogenic, anti-inflammatory | S |
| 25    | Pterocarpus santalinus L.f. Leguminoseae, Rakthachandam, heart wood | Blood purifying and removing scars | A paste made up of heart wood is taken internally as a blood purifier and externally for removing scars | Purifies blood and cures skin diseases and poisonous affections | S |
| 26    | Saraca asoca (Roxb.) de Wilde. Leguminaceae, Ashokham, bark | Uterine disorders | Decoction made up of bark is taken internally once daily for 7 days | Uterine disorders, burning sensations | S |
| 27    | Steriospermum suaveolens Roxb. DC. Bignoniaceae, Padiri, seeds | Burning sensation | External application of seed paste | Cardiogenic, diuretic and pain relief | D |
| 28    | Vernonia anthelmintica (L.) Willd, Compositae, Kattujeerakam, seeds | Inflammation against lice | Seed paste is applied to affected portion, used externally to kill lice | Cure ulcers, vata, kapha and roundworms | D |
# A comparative note on the ethnomedicinal plants used by the Kattunaikka and Paniya tribes of Nilambur forest, Malappuram district, Kerala, (India)

## Table 3
List of plant species used by Kattunaikka and Paniya tribes in combined form for various ailments/conditions

| S. no | Botanical name, family, local name, part used | Tribes | Tribal use | Ayurvedic uses | Similar (S)/ Dissimilar (D) |
|-------|---------------------------------------------|--------|------------|----------------|----------------------------|
| 1     | Ageratum conyzoides L. Compositeae, Katappa, leaves | P      | Wounds     | -              | -                          |
| 2     | Allium sativum L. Amaryllidaceae, Vellulli, bulbs | K      | Cough, cold and fever | Antithrombic, upper respiratory tract infections | S                          |
| 3     | Alpinia galanga, Zingiberaceae, Peraratha, rhizome | P      | Rheumatism  | Rheumatism     | S                          |
| 4     | Aristolochia tagala Aristolochiaceae,埃武拉, whole plant | K      | Snake bite  | -              | -                          |
| 5     | Asparagus racemosus* Asparagaceae, Satavari, tubers | K      | Postpartum vigor | Gynoecological problems, galactagogue | S                          |
| 6     | Cassia fistula Leguminosae, Kanikonna, tender root | P      | Rheumatism, snake bite | Purgative, febrifugal, astringent | D                          |
| 7     | Catharanthus roseus Apocynaceae, Ushamalari, whole plant | K      | Tuberculosis | -              | -                          |
| 8     | Cocos nucifera Arecaceae, Thengu, coconut milk | P      | Lactation   | Urinary disorders, gastroenteritis | D                          |
| 9     | Coix lacryma-jobi Poaceae, Kakkalapungu, seeds | P      | Postpartum vigor | Diuretic     | D                          |
| 10    | Cuminum cyminum Apiaceae, Jeeraka, seeds | P      | Lactation, kidney stone and abdominal disorders | Diuretic | D                          |
| 11    | Curcuma longa Zingiberaceae, Manjali, rhizome | P; K   | Postpartum vigor, snake bite, wounds | Anti-inflammatory, anti-bacterial, gastroprotective effects | S                          |
| 12    | Desmodium gangeticum* Leguminosae, Orila, roots | K      | Postpartum vigor | Laxative and nerve tonic, galactagogue | S                          |
| 13    | Eclipta alba Compositae, Kankanu, whole plant | P      | Hair fall | Hair fall | S                          |
| 14    | Gmelina arborea Lamiaceae, Kumbili, bark | K      | Cough and stomach pain | Stomach pain | S                          |
| 15    | Holostemma ada-kodien* Apocynaceae, Adapathyani, tuberous roots | K      | Tuberculosis | Laxative, rejuvenative | D                          |
| 16    | Justicia gendarussa Burm.f. Acanthaceae, Vathamkolli, whole plant | P      | Rheumatism | Oedema and rheumatism | S                          |
| 17    | Lawsonia inermis Lythraceae, Mallanchi, dried leaves | P      | Hair fall | Hair fall | S                          |
| 18    | Momordica charantia Cucurbitaceae, Kaalakka, leaves | P      | Snake bite | Anthelmintic | D                          |
| 19    | Ocimum sanctum Lamiaceae, Tului, whole plant | K      | Cough, cold and fever, tuberculosus | Cold, fever | S                          |
| 20    | Phyllanthus emblica Phyllanthaceae, Nelli, dried fruits | P      | Hair fall, postpartum vigor | Gastrointestinal | S                          |
| 21    | Piper longum* Piperaceae, Thippali, fruits | K      | Cough, cold and fever | Cough, cold, asthma | S                          |
| 22    | Piper nigrum Piperaceae, Kurumulukki, fruits | K      | Cough, cold and fever | Cold, fever | S                          |
| 23    | Pseudaethridia viscosa Leguminosae, Movilla, roots | K      | Postpartum vigor | Astringent, febrifuge | D                          |
| 24    | Psidium guajava Myrtaceae, Perakka, bark | K      | Cough and stomach pain | - | -                          |
| 25    | Rasvovila serpentina Apocynaceae, Sarpagandi, roots | K      | Snake bite | Neuro-psychiatric disorders, psychosis | D                          |
| 26    | Rotula aquatica* Boraginaceae, Kallur vanchi, roots | P      | Kidney stone and abdominal disorders | Kidney stone | S                          |
| 27    | Sapindus trifoliatus Sapindaceae, Uruvanchikkaya, fruits | P      | Wounds | Astringent, emetic, detergent, anthelmintic | D                          |
| 28    | Sida cordifolia Malvaceae, Anakurumthotti, roots | P      | Hair fall | Rheumatism, neurological disorders | S                          |
| 29    | Solanum melongena Solanaceae, Cheruvazhuthana, roots | P      | Wounds | Anti-asthmatic | D                          |
| 30    | Strychnos nux-vomica Loganiaceae, Kanjiram, bark | P      | Snake bite | Neurological affections | D                          |
| 31    | Trigonella foenum-graecum* Leguminosae, Ulva, seeds | K; P   | Cough, cold and fever, kidney stone and abdominal disorders | Flatulence, dyspepsia, colic, diarrhoea, dysentery | S                          |

Note: (*) Used as single plant remedy; P: Paniyars; K: Kattunaikkans.

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Ethnomedicinal uses

Kattunaikka and Paniya tribes revealed their knowledge on the use of 79 medicinal plants and about 38 ailments/conditions. Paniya tribes revealed information about the use of 41 species, whereas Kattunaikkans about 43 species which are used as either single or combined forms of medicines. Five species recorded were commonly used by both the tribes. The Paniya tribes revealed information about 24 species which are used as single plant remedies, whereas Kattunaikkans described 28 species (Tables 1 and 2). Information collected from both the tribes on some combined forms of preparations for various conditions is given in Tables 3 and 4. Among the 18 species used by Paniya tribes in combined form of preparations, only one species (Rotula aquatica) was used as the single plant remedy also. In the case of Kattunaikka tribes, out of the 15 species used in combination forms, one species (Desmodium gangeticum) is mentioned as single plant remedy also. Out of the five species used commonly in single or compound form, only two species, i.e., Trigonella foenumgraecum and Curcuma longa, were commonly used by the two tribes in combination remedies (Tables 3 and 4). The species were suggested for various diseases like bronchial asthma, cardiac disorders, diabetes, diarrhoea, epilepsy, gynecological disorders, kidney stone, rheumatism, snake bite, body pain and fever.

One point of interest is that there was not even a single species commonly used by the two tribes as single plant remedy for a similar condition or ailment. It was observed that for similar conditions, both the tribes used different plant species. The knowledge and information revealed by Paniya tribes were rich in terms of usage of species for various ailments/conditions compared to Kattunaikkans. In the Paniya community, the number of plants used for a similar condition/ailment was more compared to Kattunaikkan community. For example, for curing skin problems, Paniya tribes revealed use of five species, whereas the Kattunaikka tribes revealed the use of only two. In other words, Kattunaikkans described only twenty-one species for ten ailments, in place of the thirty-five species described by Paniya tribes for same number of ailments (Table 5). The case of using one species for many conditions/ailments was also rarely recorded within the Paniya tribes. For example, Paniyars use Holostemma ada-kodien for postpartum vigor and eye diseases and Indigofera tinctoria for skin diseases, jaundice and also as a hair tonic. For about ten conditions/ailments such as diabetes, epilepsy and diarrhoea, Kattunaikka tribes alone described certain remedies and for certain other conditions/ailments like piles, leprosy, jaundice and joint pain only Paniya tribes described remedies (Table 6).

| TABLE 4 |
| Some combined form of preparations used by the Paniya and Kattunaikka tribes for various conditions |

| Condition | Mode of administration | Tribes |
|-----------|------------------------|--------|
| Cough, cold and fever | Decoction made up of dry Zingiber officinale + Piper longum + Ocimum sanctum + Allium sativum + Piper nigrum + Trigonella foenum-graecum is taken internally | Kattunaikka |
| Cough and stomach pain | Ripe fruits of Gmelina arborea + Psidium guajava are taken internally once a day for 2 weeks | Kattunaikka |
| Hair fall | Lawsonia inermis (dried leaves) + Eclipta alba (whole plant) + Sida cordifolia (root) + Phyllanthus emblica (dried) all are crushed and heated with coconut oil and applied on hair once daily | Paniya |
| Kidney stone and abdominal disorders | Trigonella foenum-graecum + whole plant paste of Rotula aquatica + Cuminum cyminum is taken internally in empty stomach once daily for man and twice daily for women | Paniya |
| Lactation | Coconut milk (Cocos nucifera) + 4 or 5 earthworms + Cuminum cyminum is made in to a paste and mixed in half glass of cow milk only one time | Paniya |
| Postpartum vigor | A decoction made up of Phyllanthus emblica + Desmodium gangetium + Pseudarthria viscosa + Asparagus racemosus is taken internally three months | Kattunaikka |
| | Seeds of Coix lacryma-jobi + Curcuma longa applied on stomach | Paniya |
| Rheumatism | Alpinia galanga rhizome paste + Cassia fistula is applied externally | Paniya |
| | Justicia jerandrossa whole plant mixed with Azadirachta indica | Paniya |
| Snake bite | Bark of Strychnos nux-vomica (small amount) + Momordica charantia (4 or 5 leaves) are crushed and take internally on early morning and evening. Bitted portion is recommended to tie with a hair to avoid spreading | Paniya |
| | Rauvolfia serpentina root paste + Curcuma longa is applied to affected portion | Kattunaikka |
| | Cassia fistula tender root + Curcuma longa external application for 7 days. That person is recommended to avoid sleep and also salt, chilly and oil | Paniya |
| | Aristolochia tagala whole plant + Curcuma longa external application for 7 days | Kattunaikka |
| Tuberculosis | A decoction made up of root tuber of Holostemma ada-kodien + Catharanthus roseus + Ocimum sanctum is taken internally twice a day for one month. | Kattunaikka |
| Wounds | Ageratum conyzoides plant paste + Curcuma longa are applied externally for seven days | Paniya |
| | External application of Sapindus trifoliatus fruits + Solanum melongena leaf for wounds on head | Paniya |
### TABLE 5
Difference in use of plants for similar ailments and conditions by Paniya and Kattunaikka tribes

| Conditions                        | No. of species used | Name of species used | Paniya | Kattunaikka | Paniya | Kattunaikka |
|-----------------------------------|--------------------|----------------------|--------|-------------|--------|-------------|
|                                    |                    |                      |        |             |        |             |
| Skin diseases                      | 5                  | Calycocarpus floribunda | Anamirta cocculus | 2     |                |            |
|                                    |                    | Datura stramonium     | Ixora coccinea   |       |                |            |
|                                    |                    | Hydrocoturus pentandrus|                    |       |                |            |
|                                    |                    | Indigofera tinctoria  |                    |       |                |            |
|                                    |                    | Senna tora           |                    |       |                |            |
| Spider bite                        | 5                  | Cassia fistula        | Aristolochia tagala| 4     |                |            |
|                                    |                    | Curcuma longa         | Aristolochia indica|      |                |            |
|                                    |                    | Schleichera oleosa   | Curcuma longa     |        |                |            |
|                                    |                    | Strychnos nux-vomica  | Rauvolfia serpentina|      |                |            |
|                                    |                    | Momordica charantia  |                    |        |                |            |
| Rheumatism                         | 3                  | Alpinia galanga      | Azadirachta indica| 1     |                |            |
|                                    |                    | Cassia fistula       |                    |        |                |            |
|                                    |                    | Justicia gendarussa  |                    |        |                |            |
| Asthm                              | 1                  | Ricinus communis     | Calotropis gigantea| 2     |                |            |
|                                    |                    |                      | Plumbago zeylanica|        |                |            |
| Gynecological problems             | 1                  | Asparagus racemosus  | Nyctanthes arbor-tristis| 2     |                |            |
|                                    |                    |                      | Saraca asoca     |        |                |            |
| Cardiac disorders                  | 5                  | Curcuma longa        | Curcuma longa    | 2     |                |            |
|                                    | Post-partum health  | Coix lacryma jobi   | Cycas cincinalis |        |                |            |
|                                    |                    | Cyclea peltata      | Mesua ferrea     |        |                |            |
|                                    |                    | Holostemma ada-kodien| Pseudanthia viscoso|      |                |            |
|                                    |                    | Phyllanthus emblica  | Asparagus racemosus|      |                |            |
| Cuts and wounds                    | 6                  | Ageratum conyzoides  | Boerhavia diffusa| 2     |                |            |
|                                    |                    | Curcuma longa        | Solanum violaceum|        |                |            |
|                                    |                    | Ficus exasperata     | Curcuma longa    |        |                |            |
|                                    |                    | Lantana camara       | Cycas cincinalis |        |                |            |
|                                    |                    | Sapindus trifoliatus | Mesua ferrea     |        |                |            |
|                                    |                    | Solanum melongena   | Pseudanthia viscoso|      |                |            |
| Hair loss and growth               | 1                  | Eclipta alba         | Naringi crenulata| 1     |                |            |
|                                    |                    | Hydrocoturus pentandrus|                    |       |                |            |
|                                    |                    | Indigofera tinctoria |                    |       |                |            |
|                                    |                    | Lawsonia inermis     |                    |       |                |            |
|                                    |                    | Sida cordifolia      |                    |       |                |            |
|                                    |                    | Phyllanthus emblica  |                    |       |                |            |
| Burning sensation                  | 1                  | Wrightia tinctoria   | Myristica malabarica| 2     |                |            |
|                                    |                    |                      | Stenotispermum suaveolens|    |                |            |
| Total species                      | 35                 |                      | 21                 |        |                |            |

### TABLE 6
Ailments and conditions and their remedial plants exclusively used by Paniya and Kattunaikka tribes

| Ailments/conditions               | Tribes |
|-----------------------------------|--------|
|                                   | Paniya | Kattunaikka |
| Diabetes                          | -      | Aegle marmelos |
| Epilepsy                          | -      | Gymnema sylvestre |
| Pitha                             | -      | Bacopa monieri |
| Flatulence and colic              | -      | Clitoria ternatea |
| Abdominal disorders               | -      | Emilia sonchifolia |
| Diarrhoea                         | -      | Euphorbia nivala |
| Head ache                         | -      | Kalmahoe schweinfurthii |
| Vomiting                          | -      | Melia azedarach |
| Back pain / body pain             | -      | Oxalis corniculata |
| Blood purifying and removing scars| -      | Premna serratifolia |
| Inflammation                      | -      | Pterocarpus santalinus |
| Piles                             | Curculigo orchoides | - |
| Rotula aquatica                   | -      | Vernonia anthelmintica |
Ethnobotanical survey in Mundakunnu village of Gudalur taluk, Nilgiri district of Tamil Nadu, India reveals that six plant species are commonly used for different ailments by the Paniya tribes from two localities. But, tribes from both places use *Hemideina indicus* as a refreshing drink or coolant [8]. Thomas et al., [3] reports ethnoveterinary uses of 30 species from the Paniyars tribe of Malappurams, in which two species, *Asparagus nasconus* and *Elephantopus scaber* are found commonly used. They also report that Paniyars have a strong tendency of keeping their traditional knowledge and techniques secret. Ramachandran et al., [9] studied the wild edible plants used by the Paniyas and Kurumbas of Western Nilgiris, Tamil Nadu and describe nine species which are used as food and also for curing various common ailments. Plant species such as *Lantana camara*, *Momordica charantia*, *Cycas peltata*, *Solanum anguifolium* (*Solanum violaceum*) and *Phyllanthus emblica* which are consumed as wild edible plants by the Paniya and Kurumba tribes of Nilgiris, were found to be used for therapeutic purpose among the Paniya tribes in our study. Prasad et al., [10] records the plants used by the Paniya and Kattunaiakka tribes for the treatment of digestive system disorders in Wayanad district, Kerala and they mention certain similarities in the usage of plants among these two tribes. Only two species, *Aegle marmelos* and *Artocarpus heterophylus*, used by the Kattunaiakka tribes of Nilambur forests for diabetes and snake bite respectively, reported in our study are used by both the tribes of Wayanad district for digestive system disorders. Amuthavallavan [11] documents the traditional ethno-medicinal practices of Kattunayakan of southern northern Arcot district, Tamil Nadu and nearly ten medicinal species utilize by them in traditional healing system is found to be common in our report for same or different conditions. They also report the use of two or more remedies for the same disease indicating that one is superior to the other and such observation has been recorded in our study also. Out of the 32 plant species reported by Naseef et al., [12] against gynaecological problems by the Paniya tribes of Nelliyayal of Wayanad district, Kerala, only one species, *Holostemma ada-kodien* was found commonly used by the Paniya tribes of Nilambur forest for same condition.

Ayurvedic use of ethnobotanical plants

Ayurveda, which also relies on medicinal plants for treatment, is possibly the oldest traditional medicinal system in the Indian sub-continent dating back to nearly five thousand years ago. Of the 79 species recorded in this study, 64 species (81%) were found to be used in the Ayurvedic system of medicine and 65% for similar conditions. Nearly 79% of the plants used as single plant remedies by the Paniya tribes are recorded to be used in the Ayurvedic system of medicine for treating similar (73.7%) or different (26.3%) conditions (Table 1). In the case of the Kattunaiakka tribes 78.6% of the plants used as single plant remedies are recorded to be used in the Ayurvedic system of medicine for treating similar (77%) or different (23%) conditions (Table 2). Among the 32 plants used in the combined form of drugs, 87.5% are being used in Ayurveda and similarity in use was recorded in 53.6% cases (Table 3). The Ayurvedic system of medicine has been the major medicinal system practiced in Kerala since time immemorial. The traditional medicinal practice of the tribal communities typically involves simple use of plant parts of single plants or combination of 3 or 4 items, whereas Ayurvedic formulations mostly contains combination of many medicinal plants. The observation by Rahmatullah et al., [13] that use of medicinal plants in the traditional medicine practiced by Chakma tribes in Bangladesh is having resemblance to their use in Ayurveda, supports our view. Of the 73 total plants used by Chakma tribe, the medicinal uses of 33 plants are similar to Ayurvedic uses, as reported for various Ayurvedic preparations. While documenting the tribal medicinal practices of the Debbarma clan of the Tripura tribe, residing in Dolusora Tripura Palli of Moulibazar district of Bangladesh, Kabir et al., [14] records that a number of the plants used by the clan healer have similar uses in Ayurveda, but differ considerably in their therapeutic uses from that reported for other tribes in Bangladesh.

According to some researcher’s traditional medicine and biomedicine may be incompatible and the use of biomedicine and biomedical concepts often displaces the use of traditional medicine and medical beliefs. In contrast, other scholars have found that traditional medicine and biomedicine can coexist, complement and blend with each other. Giovannini et al., [15] use an econometric model and quantitative data to test the association between individual knowledge of pharmaceuticals and individual knowledge of medicinal plants in a rural indigenous community at Mexico. The results suggest that, in the study site, individual knowledge of medicinal plants and individual knowledge of pharmaceuticals co-exist in a way which might be interpreted as complementary. They conclude that social organization involves in the use of medicines from both traditional medicine and biomedicine is of particular significance and the use of pharmaceuticals alone is not associated with a decline in knowledge/use of medicinal plants.

CONCLUSION

The study revealed that Paniya and Kattunaiakka tribes of Nilambur forest use many plants or plant parts for both internal and external applications for the treatment of various ailments in their daily life. The difference in usage of plants by same tribes occupying different localities and different tribes of the same or nearby localities was observed. The similarity and difference observed between tribal and Ayurvedic system also requires more investigation. The use of plants among these tribes reflects their interest in ethnomedicine and further investigation on unexplored species may led to the discovery of novel pharmaceutical products. Study may produce valuable information on new phytopharmaceuticals for new drug development in future towards combating various human ailments.

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