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Diversity of Trees in Narikkode Hill, Kannur, Kerala

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***Abstract*:** The present study identified a total of 88 taxa belonging to 73 genera and 37 families from Narikkode Hill, Kannur, Kerala. Among these, dicotyledons were represented by 35 families while monocotyledons and gymnosperms by one family each. Five species were endemic. The dominant families were Mimosaceae, Moraceae and Rutaceae (6 species each) followed by Anacardiaceae, Euphorbiaceae and Fabaceae (5 species each) and Meliaceae (4 species). This study helped in generating primary data on the diversity and distribution of trees in Narikkode Hill.

***Keywords*:** Tree diversity, Endemic, Western Ghats, Narikkode Hill

Plants are essential for the planet and all living things including humans. They provide food, fiber, shelter, medicine, and fuel. The basic food for all organisms is produced by green plants, forming the critical base of the food chain in all ecosystems. Human beings have used plants as food, medicine, and for meeting other needs since ancient times (Fernando 2012, Numpulsuksant et al., 2021). Plants are considered as rich source of bioactive chemicals, and they may serve as an alternative source for various medicines. Secondary metabolites or phytochemicals from plants exhibit excellent pharmacological activities such as antioxidative, antiallergic, antibiotic, and anti-carcinogenic properties. They have supported human societies even before the establishment of agriculture by providing food, clothing, shelter, remedies, and poisons.

Trees are perennial woody plants typically characterized by a single main stem or trunk, supporting branches and leaves. They play a crucial role in the ecosystem, providing a wide range of environmental, social and economic benefits. Kumar et al. (2020) documented 221 tree species from Amarkutir of West Bengal. The 106 species of trees from tropical mixed dry deciduous forest landscape in the Nilgiri Biosphere Reserve of the Western Ghats were recorded (Anitha et al., 2010). Volga et al. (2013) reported 136 endemic trees of Western Ghats. Manoj et al. (2012) reveals 63 riparian tree species of Alakyam stream. Mastan et al. (2020) reported 97 tree species in Nithyapoojakona dry deciduous forest of Sri Lankamalleswara wildlife sanctuary, Southern Eastern Ghats. Devi et al. (2018) observed 125 tree species belonging to 90 genera and 46 families in tropical moist forests of Mizoram. Nayak and Sahoo (2020) reported 94 tree species belonging to 29 families in forests of Odisha and the most dominant family was Fabaceae. Similarly, Roy (2020) recorded 88 species of Magnoliophyta from an urban green space in Purulia, West Bengal. A total of 992 trees from 66 species belonging to 31 families were recorded from Thodupuzha urban region of Kerala (Padmakumar et al., 2021).

The complete documentation of tree diversity is essential for formulating conservation strategies. Documentation of tree diversity in major ecosystems is either completed or ongoing. However, some areas remain unexplored. In this context, the present study has been undertaken to study and document the tree diversity of Narikkode Hill in Kannur district of Kerala.

MATERIAL AND METHODS

Study area: Narikkode Hill is situated in Triprangottur Grama Panchayath and is located between 11.8044 N, 75.6841 E in the Kannur district of Kerala. It covers a total area of 32.39 sq.km. The terrain is hilly and possesses remnants of erstwhile forests. The total population of the area is 333, of which 254 people belong to the tribal category Kurichiya, and 79 people belong to the Christian community.

Survey procedure: Extensive field surveys were undertaken during 2021-2022 to document the diversity of tree species. Information pertaining to the diversity was collected and representative specimens were gathered. Data on the uses of trees, along with its edible parts, medicinal parts, and the ailments they treat, were collected through surveys from tribal people residing in the study area. Plants collected during the present study were identified using floras (Hooker 1872-1897, Gamble 1915-1936, Ramachandran & Nair 1988, Sasidharan 2004), journals, and other relevant literature. Voucher specimens were prepared following routine herbarium

methods (Fosberg and Sachet 1965, Jain and Rao 1976) and deposited in Mahatma Gandhi Government Arts and Science College Herbarium. Photographs of live specimens were also taken from the field. The identity of doubtful specimens was confirmed at the Central National Herbarium (CAL), Calicut University (CALI), and Botanical Survey of India, Southern Regional Centre, Coimbatore (MH).

RESULTS AND DISCUSSION

The study area is hilly and encompasses a variety of vegetation types such as semievergreen forests, dry deciduous forests and grasslands. The area exhibits degraded habitats due to anthropogenic activities such as agriculture, grazing etc. These diverse habitats contribute to the ecological richness of Narikkode hill in Kannur district.

The present study has recorded 88 taxa belonging to 73 genera and 37 families. The families were arranged according to Bentham and Hooker's system of classification (Bentham and Hooker, 1862-1883). Among these, 84 species were dicotyledons, 3 were monocotyledons, and one species to gymnosperm. The monocotyledons include *Cocos nucifera* L., *Areca catechu* L., and *Arenga wightii* Griff belonging to Arecaceae. The gymnosperm reported from the study area is *Araucaria heterophylla* (Salisb.) Franco belonging to Araucariaceae. The dominant families were Mimosaceae, Moraceae, Rutaceae, Anacardiaceae, Euphorbiaceae, Fabaceae and Meliaceae. The present study recorded 5 endemic species viz., *Arenga wightii* Griff., *Lagerstroemia microcarpa* Hance, *Vateria indica* L. which are endemic to Western Ghats and *Holigarna arnottiana* Hook.f., *Hopea parviflora* Bedd. which are endemic to Southern Western Ghats. Out of the 88 taxa recorded, 48 are utilized by the people to cure various ailments, and 24 are consumed in various ways on a day-to-day basis. A total of 57 tree species from the study area belongs to various IUCN categories (Table 1).

Among these, 24 taxa were observed in sacred groves, such as *Alstonia scholaris* (L.) R. Br., *Artocarpus*

Table 1. List of tree species

Binomial	Family	Local name	Phenology	Uses	Edible part	Medicinal parts	Ailments treated	IUCN Status
Acacia catechu (L.) Willd.	Mimosaceae	Karingali	March-September	Medicinal	-	Bark	Cough, Ulcer	LC
Aegle marmelos (L.) Correa.	Rutaceae	Koovalam	March-May	Medicinal, Edible	Fruit	Leaves	Fever, Nausea,Vomiting, Swellings, Dysentery	NT
Albizia chinensis (Osbeck) Merr.	Mimosaceae	Vaaka	March-July	-	-	-	-	-
A. lebbeck (L.) Benth.	Mimosaceae	Peelivaka	March-December	Medicinal	-	Bark	Asthma, Cold, Cough	LC
A. odoratissima (L. f.) Benth.	Mimosaceae	Irumbukunni	April-January	-	-	-	-	LC
Alstonia scholaris (L.) R. Br.	Apocynaceae	Ezhilampala	October-February	Medicinal	-	Bark	Skin diseases, Rheumatism	LC
Anacardium occidentale L.	Anacardiaceae	Kashumavu	November-April	Medicinal, Edible	Fruit	Bark	Skin diseases	LC
Annona reticulata L.	Annonaceae	Aathachakka	May-August	Medicinal, Edible	Fruit	Seed	Diarrhoea	LC
Araucaria heterophylla (Salisb.) Franco.	Araucariaceae	Island pine	Throughout the year	-	-	-	-	VU
Areca catechu L.	Arecaceae	Kamuku	Throughout the year	Medicinal	-	Seed	Bronchitis.Obesity, Anaemia, Leprosy	-
Arenga wightii Griff.	Arecaceae	Malanthengu	July-September	-	-	-	-	VU
Artocarpus incisus (Thunb.) L.f.	Moraceae	Kadaplavu	January-June	Edible	Fruit	-	-	-
A. heterophyllus Lam.	Moraceae	Plavu	November-April	Edible	Fruit	-	-	-
Averrhoa bilimbi L.	Averrhoaceae	Bilumbi	March-May	Edible	Fruit	-	-	-
A. carambola L.	Averrhoaceae	Chathurappuli	May-August	Edible	Fruit	-	-	-
Azadirachta indica A. Juss.	Meliaceae	Veppu	February-September	Medicinal	-	Leaves, Flower, Seed	Fever, Skin diseases	LC

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Table 1. List of tree species

Binomial	Family	Local name	Phenology	Uses	Edible part	Medicinal parts	Ailments treated	IUCN Status
Bischofia javanica Blume	Euphorbiaceae	Cholavenga	March-October	-	-	-	-	LC
Bridelia retusa (L.) A. Juss.	Euphorbiaceae	Mulluvenga	August-December	-	-	-	-	LC
Caesalpinia sappan L.	Caesalpiniaceae	Sappannam	August-December	Medicinal	-	Whole plant	Diarrhoea, Dysentery	LC
Calophyllum inophyllum L.	Clusiaceae	Punna	December-January	Medicinal	-	Leaves, Flower	Ulcer,Rhe-umatism	LC
Careya arborea Roxb.	Lecythidaceae	Aalam	February-July	Medicinal	-	Bark	Bronchitis, Skin disease	-
Carica papaya L.	Caricaceae	Pappaya	Throughout the year	Medicinal, Edible	Fruit	Bark, Leaves	Arthritis	DD
Cassia fistula L.	Caesalpiniaceae	Konna	February-September	Medicinal	-	Root,Leaves	Relieving pain, Edema, Skin irritation	LC
Casuarina littorea Oken	Casuarinaceae	Kattadi	July-September	-	-	-	-	-
Chrysophyllum roxburghii G.Don	Sapotaceae	Pulichakka	April-November	-	-	-	-	LC
Cinnamomum verum J. Presl	Lauraceae	Edana	March-April	Medicinal	-	Whole plant	Asthma, Diarrhoea	-
Citrus aurantium L.	Rutaceae	Maduranaragam	October-December	-	-	-	-	-
Citrus maxima (Burm.) Merr.	Rutaceae	Babloos	April-November	Edible	Fruit	-	-	LC
C. medica L.	Rutaceae	Madulungam	November-April	Medicinal	-	Fruit	Sore throat, Cough, Asthma	LC
Cocos nucifera L.	Arecaceae	Thengu	Throughout the year	Medicinal, Edible	Fruit	Fruit	Arthritis,Diarrhoea	-
Coffea arabica L.	Rubiaceae	Kaappi	March-December	-	-	-	-	-
Dalbergia latifolia Roxb.	Fabaceae	Eeti	August-September	-	-	-	-	VU
Erythrina variegata L.	Fabaceae	Murikku	March-April	Medicinal	-	Bark, Leaves	Joint pain	LC
Ficus exasperata Vahl.	Moraceae	Parakam	February-April	-	-	-	-	LC
F. hispida L.f.	Moraceae	Kattathi	Septembe-May	-	-	-	-	LC
F. microcarpa L.f.	Moraceae	Ithi	March-May	Medicinal	-	Leaves	Liver disease	LC
F. racemosa L.	Moraceae	Athi	February-May	Medicinal	-	Leaves	Diabetes, Liver disorder, Diarrhoea	LC
Flacourtia jangomas (Lour.) Raeusch.	Flacourtiaceae	Lavalolikka	November-April	Medicinal, Edible	Fruit	Root, Leaves	Bronchitis, Toothache	-
Garcinia mangostana L.	Clusiaceae	Mangosteen	Throughout the year	Edible	Fruit	-	-	-
Gliricidia sepium (Jacq.) Kunth	Fabaceae	Seemakonna	March-May	-	-	-	-	LC
Gmelina arborea Roxb. ex Sm.	Verbenaceae	Kumizhu	January-June	Medicinal	-	Whole plant	Fever, Thirst, Piles	LC
Grevillea robusta A.Cunn. ex R. Br.	Proteaceae	Silveroak	January-June	-	-	-	-	-
Grewia tiliifolia Vahl	Tiliaceae	Chadachi	June-September	Medicinal, Edible	Fruit	Bark, Root	Diarrhoea, Skin diseases	LC
Hevea brasiliensis (Willd. ex .Juss.) Müll.-Arg.	Euphorbiaceae	Rubber	February-June	-	-	-	-	LC

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Table 1. List of tree species

Binomial	Family	Local name	Phenology	Uses	Edible part	Medicinal parts	Ailments treated	IUCN Status
Holigarna arnottiana Hook.f.	Anacardiaceae	Cheru	January-July	Medicinal	-	Leaves	Inflammation, Arthritis, Obesity	-
Hopea parviflora Bedd.	Dipterocarpaceae	Thambakam	January-June	-	-	-	-	LC
Lagerstroemia microcarpa Hance	Lythraceae	Venthekku	June-February	-	-	-	-	-
Lannea coromandelica (Houtt.) Merr.	Anacardiaceae	Karayam	January-May	Medicinal	-	Leaves	Hepatitis, Diabetes	LC
Macaranga peltata (Roxb.) Müll.-Arg.	Euphorbiaceae	Uppila	October-December	-	-	-	-	LC
Mallotus philippensis (Lam.) Müll.-Arg.	Euphorbiaceae	Sinduri	October-March	Medicinal	-	Bark, Leaves	Skin problem, Bronchitis, Diabetes, Jaundice	LC
Mangifera indica L.	Anacardiaceae	Mavu	January-May	Edible	Fruit	-	-	DD
Manilkara zapota (L.) P. Royen	Sapotaceae	Sapota	February-June	Edible	Fruit	-	-	LC
Michelia champaca L.	Magnoliaceae	Chembakam	March-July	Medicinal	-	Root, Bark, Flower	Cough,Bronchitis, Hypertension, Dyspepsia,	LC
Melia dubia Cav.	Meliaceae	Valiyaveppu	March-February	-	-	-	-	-
Miliusa tomentosa (Roxb.) Finet & Gagnep.	nnonaceae	Malaveppu	October-May	-	-	-	-	LC
Moringa pterygosperma Gaertn.	Moringaceae	Muringa	November-March	Medicinal, Edible	Fruit, Leaves	Bark, Leaves, Flower, Fruit	Arthritis, Rheumatism	-
Murraya koenigii (L.) Spreng.	Rutaceae	Kariveppila	March-July	Medicinal	-	Root, Leaves	Piles, Inflammation, Itching, Body aches	LC
Myristica beddomei King	Myristicaceae	Pathiri	December-May	-	-	-	-	-
M. fragrans Houtt.	Myristicaceae	Jaathikka	December-August	Medicinal	-	Fruit	Anxiety, Nausea, Cholera, Stomach cramps	DD
Olea dioica Roxb.	Oleaceae	Edala	November-April	Medicinal	-	Whole plant	Skin diseases, Rheumatism	-
Persea macrantha (Nees) Kosterm.	Lauraceae	Kulamavu	December-May	Medicinal	-	Leaf, Bark	Fracture, Asthma	-
Phyllanthus emblica L.	Euphorbiaceae	Nelli	July-February	Medicinal, Edible	Fruit	Fruit	Jaundice, Inflammation.	LC
Pongamia pinnata (L.) Pierre	Fabaceae	Ungu	April-December	Medicinal	-	Whole plant	Piles, Skin diseases, Wound	LC
Psidium guajava L.	Myrtaceae	Perakka	March-May	Edible	Fruit	-	-	LC
Pterocarpus marsupium Roxb.	Fabaceae	Venga	September-October	Medicinal	-	Whole plant	Boils, Sores	NT
Santalum album L.	Santalaceae	Chandhanam	November-December	Medicinal	-	Bark	Bronchitis, Cystitis	VU
Sapindus trifoliatus L.	Sapindaceae	Soapinkaimaram	December-April	-	-	-	-	-
Schleichera oleosa (Lour.) Oken	Sapindaceae	Poovam	March-June	Medicinal	-	Bark	Skin inflammation, Ulcer, Itching, Acne	LC
Spondias pinnata (L.f.) Kurz	Anacardiaceae	Ambazham	March-December	Medicinal, Edible	Fruit	Bark	Joint pain, Diarrhoea, Dysentery, Vomiting	-
Sterculia guttata Roxb.	Sterculiaceae	Peenari	September-March	Medicinal	-	Leaf, Bark	Rheumatism	-

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Table 1. List of tree species

Binomial	Family	Local name	Phenology	Uses	Edible part	Medicinal parts	Ailments treated	IUCN Status
Stereospermum colais (Buch. -Ham. ex Dillwyn) Mabb.	Bignoniaceae	Poopathiri	February-October	Medicinal	-	Root	Piles, Nervous disorders	-
Strychnos nux-vomica L.	Loganiaceae	Kanjiram	March-December	Medicinal	-	Whole plant	Swelling of stomach, Constipation, Anxiety, Migraine	-
Swietenia macrophylla King	Meliaceae	Mahagony	April-March	-	-	-	-	EN
S. mahagoni (L.) Jacq.	Meliaceae	Mahagony	April-November	-	-	-	-	NT
Syzygium aromaticum (L.) Merr. & L.M. Perry	Myrtaceae	Karampu	December-April	Medicinal, Edible	Flower bud	Flower bud	Scabies, Cholera, Malaria, Tuberculosis	-
S. cumini (L.) Skeels	Myrtaceae	Njerakka	December-April	Medicinal, Edible	Fruit	Bark	Sore throat, Bronchitis, Asthma, Thirst	LC
S. samarangense (Blume) Merr. & L.M. Perry	Myrtaceae	Chambakka	February-June	Edible	Fruit	-	-	LC
Tamarindus indica L.	Caesalpiniaceae	Puli	September-April	Medicinal, Edible	Fruit	Fruit	Inflammation, Stomach pain, Throat pain, Rheumatism	LC
Tectona grandis L.f.	Verbenaceae	Thekku	May-January	Medicinal	-	Bark	Bronchitis, Constipation, Hyperacidity, Dysentery	EN
Terminalia catappa L.	Combretaceae	Bhadham	March-January	-	-	-	-	LC
T. cuneata B.Heyne ex Roth	Combretaceae	Neermaruthu	November-June	Medicinal	-	Bark	Fractures, Hemorrhage, Bronchitis, Diarrhoea	-
T. paniculata B.Heyne ex Roth	Combretaceae	Venmaruthu	August-February	-	-	-	-	-
Theobroma cacao L.	Sterculiaceae	Kokko	November-May	Edible	Fruit	-	-	-
Vateria indica L.	Dipterocarpaceae	Vellappayin	March-August	Medicinal	-	Bark	Chronic bronchitis, Throat troubles	VU
Vitex altissima L.f.	Verbenaceae	Mylellu	March-July	-	-	-	-	LC
Wrightia tinctoria B.Heyne ex Roth	Apocynaceae	Dhanthapala	February-November	Medicinal	-	Bark	PilSkin diseases	LC
Xylia xylocarpa (Roxb.) W. Theob.	Mimosaceae	Irumullu	February-December	Medicinal	-	Bark	Leprosy, Wound healing, Gonorrhea, Rheumatism, Anaemia	LC
Zanthoxylum rhetsa (Roxb.) DC.	Rutaceae	Mullilam	March-November	-	-	-	-	LC

EN- Endangered; VU- Vulnerable; NT- Near Threatened; LC- Least Concern; DD- Data Deficient

heterophyllus Lam., *Careya arborea* Roxb., *Cassia fistula* L., *Chrysophyllum roxburghii* G. Don, *Cinnamomum verum* J. Presl, *Citrus medica* L., *Dalbergia latifolia* Roxb., *Ficus hispida* L. f., *Holigarna arnottiana* Hook.f., *Macaranga peltata* (Roxb.) Müll.-Arg., *Michelia champaca* L., *Moringa pterygosperma* Gaertn., *Olea dioica* Roxb., *Persea macrantha* (Nees) Kosterm., *Phyllanthus emblica* L., *Sapindus trifoliatus* L., *Schleichera oleosa* (Lour.) Oken., *Sterculia guttata* Roxb., *Strychnos nux-vomica* L., *Vateria indica* L., *Vitex altissima* L.f., *Xylia xylocarpa* (Roxb.) W. Theob. and *Zanthoxylum rhetsa* (Roxb.) DC.

There were 27 exotic tree species reported from the study area. They include species such as *Acacia catechu* (L.) Willd., *Anacardium occidentale* L., *Annona reticulata* L.,

Averrhoa bilimbi L., *Averrhoa carombola* L., *Araucaria heterophylla* (Salisb.) Franco., *Caesalpinia sappan* L., *Carica papaya* L., *Casuarina littorea* Oken, *Citrus aurantium* L., *Citrus maxima* (Burm.) Merr., *Cocos nucifera* L., *Coffea arabica* L., *Flacourtia jangomas* (Lour.) Raeusch., *Garcinia mangostana* L., *Gliricidia sepium* (Jacq.) Kunth., *Grevillea robusta* A. Cunn. ex R. Br., *Hevea braziliensis* (Willd. ex A. Juss.) Muell.-Arg., *Manilkara zapota* (L.) P.Royen, *Myristica fragrans* Houtt., *Psidium guajava* L., *Swietenia macrophylla* King, *Swietenia mahagoni* (L.) Jacq., *Syzygium aromaticum* (L.) Merr. & L.M. Perry, *Tamarindus indica* L., *Terminalia catappa* L. and *Theobroma cacao* L.

A total of 28 cultivated species were also reported. They include *Anacardium occidentale* L., *Annona reticulata* L., *Araucaria heterophylla* (Salisb.) Franco., *Areca catechu* L., *Artocarpus incisus* (Thunb.) L.f., *Averrhoa bilimbi* L., *A. carambola* L., *Careya arborea* Roxb., *Carica papaya* L., *Cinnamomum verum* J. Presl, *Citrus aurantium* L., *C. maxima* (Burm.) Merr., *C. medica* L., *Cocos nucifera* L., *Coffea arabica* L., *Erythrina variegata* L., *Flacourtia jangomas* (Lour.) Raeusch., *Garcinia mangostana* L., *Gliricidia sepium* (Jacq.) Kunth, *Hevea brasiliensis* (Willd. ex A.Juss.) Müll.-Arg., *Manilkara zapota* (L.) P. Royen, *Psidium guajava* L., *Santalum album* L., *Swietenia macrophylla* King, *S. mahagoni* (L.) Jacq., *Syzygium aromaticum* (L.) Merr. & L.M. Perry, *Tamarindus indica* L. and *Theobroma cacao* L.

The collected species have shown significant variations in their phenology, with flowering and fruiting times either advancing or delaying compared to those recorded in previous literature. Therefore, observing phenological changes in response to climate change is crucial for predicting future impacts. Large-diameter trees make up approximately half of the mature forest biomass globally. Their dynamics and sensitivities to environmental changes can significantly influence global forest carbon cycling (Lutz et al., 2018).

CONCLUSION

The present study recorded 88 tree species from Narikkode Hill of Kannur, Kerala exhibiting fairly good diversity of trees. However, the anthropogenic pressures are increasing at an alarming rate. In order to conserve the tree species which are characteristic to their unique ecosystem, regular monitoring is essential. In addition, public awareness programmes, adoption of effective and suitable conservation measures (extensive afforestation programme using indigenous species and *ex situ* multiplication of rare species) need to be implemented to save the diversity of trees.

AUTHORS CONTRIBUTION

Vismaya C. conducted the field survey, collected the plants and their uses. Pradeep Kumar G. and Girish Kumar E. identified the plants. Anusree M.E. drafted the manuscript. Sasikala K. reviewed the manuscript and corrected.

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