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Studies on floristic diversity in Pavalamalai hills, Gobichettipalayam, Erode

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Abstract

Biological classification aims to simplify and order the immense diversity of life into coherent units. The present study is focused on the taxonomic and comprehensive information of the floristic diversity and ethnomedicinal properties of plants found in Pavalamalai hill surrounded by Western Ghats. The survey was to observe, record and to initiate the activities, such as inventory of useful species, habitat characteristics, identification of potential species for various economic uses and formulation. The collected plants were preserved using herbarium preparation techniques. A total of 37 families, 72 genera and 97 plant species were recorded. Dominant families in the study are Malvaceae (7 genera, 11 species), Asteraceae (6 genera, 6 species), Fabaceae (13 genera, 14 species), Euphorbiaceae (5 genera, 6 species).

Keywords: Floristic diversity, Pavalamalai, ethnomedicinal, herbarium

Introduction

Taxonomy is a synthetic discipline (Stuessy, 1990)^[51] which draws data from various branches of biology, namely, morphology, anatomy, embryology, paleobotany, palynology, cytology, genetics, cytogenetics, chemistry, reproductive biology and ecology. While traditional plant taxonomy is exclusively based on morphological features, in the last fifty years or so, by using the knowledge and techniques of other disciplines of biology, more integrated approaches are being taken to elucidate different issues of plant classification as well as phylogeny and evolution (Stuessy, 1990)^[51]. Taxonomy, specifically morphological taxonomy, however, is now experiencing an alarming decline (Disney, 1998; Lee, 2000)^[7].

It uses morphological, behavioral, genetic, as well as biochemical observations to identify organisms. Around 1.78 million species of plants, animals, and microorganisms have been named by the taxonomists over the past 250 years. However, 5 to 30 million of species have not yet been identified. Different plants, animals, and microorganisms are grouped into different species. A species is a potentially interbreeding group of organisms, which produces a fertile offspring. It is considered as the fundamental level of the biological classification of organisms. The organisms are classified into large groups of which are called the taxonomic levels. Species, genus, family, order, class, phylum, kingdom, and domain are the ascending order of the taxonomic levels (Lakna Panawala, 2017).

Strongly correlated (even overlapping) concepts to taxonomy and systematics, are the true phylogeny, phylogenetics and phylogenetic systematics. Phylogeny can be defined as the evolutionary history of a group or lineage, the origin and evolution of higher taxa, or the natural process or repeated irreversible splitting of populations (Lincoln *et al.*, 1998; Wägele, 2005). About 1.7 million species have been named since Linnaeus and it is generally estimated that only around 10% of the world's biota has so far been described (Wilson, 2000; Disney, 2000).

Obviously, taxonomy plays the major role, and its importance as basic science for the remaining sciences should be taken into consideration. However, although society has a growing need for credible taxonomic information in order to allow us to conserve, manage, understand, and enjoy the natural world, support for taxonomy and collections is failing to keep pace (Wheeler *et al.*, 2004) and passing through a world crisis (Boero, 2001). Taxonomy is suffering from an important lack of funding. Funding for taxonomy is inadequate and largely diverted to studies of phylogeny, while thousands of species are threatened by imminent extinction (Wheeler, 2004; Wheeler *et al.*, 2004).

In India, drugs of herbal origin have been used in traditional system of medicine such as Unani and Ayurveda since ancient times. Ayurveda is one of the oldest known Indian books on plants, vedas, recorded the medicinal and religious use of herbs and plants. It is a system of medicinal uses about 700 species, Unani 700 and, modern medicine around 30 species (Jawla *et al.*, 2009) [11]. The time has come when Western countries are also showing special interest in taking treatment by Ayurvedic and Unani system. Therefore, looking to the requirement of local population and of the world, it has become necessary to concentrate on our traditional Ayurvedic and Unani system of therapy (Harilal, 2009).

Gobichettipalayam is a town panchayat in taluk headquarters of Erode district. It is located North-East about 36.6 kilometers (21.6 miles) from the center of the city. Gobichettipalayam lies in Western Ghats and located at 11.450° N 77.4300° E. It surrounded by Western Ghats mountain range on the West and North sides.

Objectives

- To study the floral diversity of Pavalamalai hill.
- To determine the medicinal value of plants through Pavalamalai hill.
- To determine the distribution and population of the plants species present in the study area.

Methodology

Study area

The Pavalamalai hill is 86km from Coimbatore and only 3.4km from Gobichettipalayam, and this place is surrounded by Western Ghats. A contest arose between Vayu the God of Wind and Adishesha the divine serpent as to whose physical prowess was mightier. Adishesha bound the Meru mount with his might. Vayu blew ferociously to break it. One piece fell here. That is Pavala Malai. This temple in Pavala Malai was built by devotees belonging to the Kanavala Kula community. Devotees had installed this Linga – Swayambu Linga - in this temple. It is the experience of the devotees that all diseases go off to one who surrenders to Lord Kailasanathar. The Pavalamalai lies temperature between 23-34°C, humidity 17% and altitude is 272 meters above the sea level. The vegetation in the hill was highly heterogeneous, and the plant population was not static which changed according to the climate and the rainfall.

People

The people surrounded by this hill are mostly village people. Their main occupation for these peoples are farmers and shepherds for grazing their cattle.

Field Survey

The study area covers about 3.146 million sq. km. The present study was performed by nine field surveys during the period of June to February. The oral discussion with people was mainly concentrated to the details like endemic and less known plants, vernacular names, flowering and fruiting period, medicinal and economic usage. The investigated plants were photographed and collected for further studies.

Method of Collection

The whole of small vascular plants should be collected including the underground portion. Roots of underground stems and storage organs were often helpful (and sometimes essential) in identifying specimens. A strong knife or small trowel was helpful for digging out a plant. Specimens

containing all essential features (all leaf types, twigs, flowers, fruits and so on) must be cut from the plant. If the species was a large herb such as a thistle, the specimen should include basal leaves as well as enough stem to show the range of stem, leaves and flowering and fruiting material. If lower and upper leaves were different, are there was significant variation between a shaded and un-shaded side of a tree, then collections should be made from both. To minimize damage to parent trees and to specimens, twigs should always be cut off cleanly with a sharp knife or pruners. Breaking the twig could strip the bark ruin a specimen or cause unnecessary harm to the tree or shrub from which it was taken.

Preparation of Herbarium

Herbarium is a collection of dried plants or specimens of plants, which were systematically, arranged using Bentham and hooker classification, for reference. In a herbarium, plants that could not be kept in the fresh state or preserved to serve as a reference collection for botanical comparison and research.

Procedure for making herbarium

It consist of a five part process,

- Collection
- Poisoning
- Pressing and drying
- Mounting
- Labeling

Collection

Plants chosen should be good representatives of the species and should contain all the essential features necessary for identification, i.e. leaves, stems, flowers & seeds (roots if suitably small and the plant is common and abundant).

Poisoning

Plant specimens were dipped in 40% formaldehyde to prevent it from insect or fungal attack.

Pressing and Drying

Plant specimens were pressed and dried between sheets of smooth, heavy paper.

Mounting

- After drying, the specimens were mounted on the herbarium sheets with water soluble glues.
- Loose bits of plant material such a fruit and seeds, were placed in an envelope attached to the herbarium sheet.

Labelling

- A plant specimen was incomplete without label data.
- A herbarium label should contain the following elements
- Habitat of the plant
- Habit of the plant
- Short Description of the plant
- Data of collection
- Name of the collector etc.

Identification of plants – Descriptive method

Plant identification was the process of matching unknown plant specimen to a known taxon. The identification of unknown plant material was accomplished with the use of published plant descriptions, illustrations and photographs; and comparison with properly identified herbarium specimens.

Results

Table 1: List of plants along with medicinal uses documented in the study area

S.no	Plant name	Family	Habit	Medicinal uses
1	<i>Annona squamosa</i> L.	Annonaceae	Tree	The seeds, crushed into a paste with water, are applied to the scalp to destroy lice.
2	<i>Argemone mexicana</i> L.	Papaveraceae	Herb	Latex of the plant is applied topically on the site of skin burns.
3	<i>Cleome viscosa</i> L.	Cleomaceae	Herb	The seeds are anthelmintic.
4	<i>Cleome gynandra</i> L.	Cleomaceae	Herb	schorpion strings
5	<i>Sida cordifolia</i> L.	Malvaceae	Herb	Stomatitis, Asthmatic bronchitis, Nervous disorders
6	<i>Sida acuta</i> Burm.	Malvaceae	Herb	Crush the fresh leaves and the juice is applied topically to treat skin burns.
7	<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	Herb	Dysentery, jaundice, piles, ulcer.
8	<i>Malvastrum coroman delianum</i> L.	Malvaceae	Herb	anti-inflammatory, analgesic
9	<i>Pavonia odorata</i> Wild	Malvaceae	Herb	skin conditioning and soothing
10	<i>Gossypium herbaceus</i> L.	Malvaceae	Herb	Juice of the leaves is used in scorpion sting and snake –bite.
11	<i>Hybiscus syracuse</i>	Malvaceae	Shrub	Skin diseases.
12	<i>Hybiscus virtifolius</i>	Malvaceae	Shrub	increasing weight, cough
14	<i>Thespesia populnea</i> (L.) Soland. ex Correa	Malvaceae	Shrub	Skin diseases, swollen joints
15	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Herb	Urinary stones, infections.
16	<i>Oxalis pes-caprae</i> L.	Oxalidaceae	Herb	The plant is palatable and in modest quantities is reasonably harmless to humans and livestock
17	<i>BBasella alba</i> L.	Basallaceae	Tree	Decoction of leaves is administered to cure all types of pains.
18	<i>CCitrus limon</i> (L.) Burm. f.	Rutaceae	Tree	rheumatism, stomach ache.
20	<i>Melia azedarach</i> L.	Meliaceae	Tree	Small box, viral fever, skin infections,
21	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Tree	topically to treat paralyze
22	<i>Cardiospermum halicacabum</i> L.	Sapindaceae	Climber	Leaf paste is mixed with onion and coconut oil is taken orally for joint pain.
23	<i>Phyllanthus amarus</i> Schumach. & Thonn.	Phyllanthaceae	Herb	Remedy against scabies, viral hepatitis, Jaundice.
24	<i>Phyllanthus maderaspatensis</i> L.	Phyllanthaceae	Herb	Seeds are medicinally used in kidney troubles. Roots are used in swellings.
25	<i>Mimosa pudica</i> L.	Fabaceae	Herb	Used as Blood purifier, diarrhoea, dysentery.
26	<i>Terminalia catappa</i> L.	Combretaceae	Tree	Cough, Dysentery.
27	<i>Syzygium cumini</i> (L.) Skeels	Passifloraceae	Tree	Dysentery, diabetics, anthelmintic fever.
29	<i>VV ernonia cinerea</i> (L.) Less	Asteraceae	Herb	Roots are used in anthelmintic, Diarrhoea and stomachache
30	<i>TTithonia diversifolia</i> (Hemsl.) A. Gray	Asteraceae	Herb	An infusion of leaves is used as a medicine for constipation, stomach pains, indigestion, and sore throat and liver pains.
31	<i>Ageratum conyzoides</i> L.	Asteraceae	Herb	The leaves of the plant are used for cuts and sores and as an external application to ague.
32	<i>Parthenium hysterophorus</i> L.	Asteraceae	Herb	It used as remedy for skin inflammation, rheumatic pain, diarrhoea urinary tract infections, dysentery, malaria and neuralgia.
33	<i>Xanthium strumarium</i> L.	Asteraceae	Shrub	In the form of a decoction it is administered in cases of long-standing malaria.
34	<i>Coccinia grandis</i> (L.) Voigt	Cucurbitaceae	Climber	Leaf juice taken internally for ulcer.
35	<i>Cucumis maderaspatanus</i> L.	Cucurbitaceae	Climber	Allergic, Asthma
36	<i>Momordica charantia</i> L.	Cucurbitaceae	Tree	Fruits is used to cure reduce blood sugar level.
37	<i>Mollugo cerviana</i> L.	Molluginaceae	Herb	An infusion of the plant is given to women to promote menstrual discharge.
38	<i>Oldenlandia umbellata</i> L.	Rubiaceae	Herb	It is also a drug that can be administered for bronchial asthma, as a decoction of the entire plant.
39	<i>Jasminum auriculatum</i> L.	Oleaceae	Climber	Mouth ulcers.
40	<i>Passiflora foetida</i> L.	Pasiifloraceae	Climber	The leaves are used to cure itches, giddiness and headache
41	<i>Prosopis juliflora</i> (SW) DC.	Fabaceae	Tree	The plant is known to be grown for land reclamation.
42	<i>Albizia lebbek</i> (L.) Benth.	Fabaceae	Tree	Toothache, Antidote, Eye Diseases
43	<i>Bauhinia variegata</i> L.	Fabaceae	Tree	The bark is alterative, anthelmintic, astringent and tonic.
44	<i>Tephrosia purpurea</i> (L.) Pers.	Fabaceae	Herb	Kidney, liver Diseases
46	<i>Clitoria ternata</i> L.	Fabaceae	Herb	Root extract is taken orally to treat indigestion, eye diseases and headache.
47	<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	Fabaceae	Tree	Root extract is an astringent, diuretic and used in urinary infections.
48	<i>I Indigofera tinctoria</i> L.	Fabaceae	Herb	The leaves are made into an ointment for treating skin diseases, wounds, sores, ulcers.
49	<i>Crotalaria pallida</i> Aiton	Fabaceae	Herb	P Promote health.
50	<i>Cynodon dactylon</i> (L.) Pers	Poaceae	Creepers	anti-venom property
51	<i>Pongamia pinnata</i> (L.) Pierre	Fabaceae	Tree	ulcer problems
52	<i>Delonix regia</i> (Hook.) Raf.	Fabaceae	Tree	Leaves chronic diarrhoea, dysentery
53	<i>Cassia siamea</i> Lam.	Fabaceae	Tree	The root decoction is used against fever, diabetes and constipation.

54	<i>Bauhinia tomentosa</i> <i>Sensu auct.</i>	Fabaceae	Tree	Digestive problems and vomiting.
55	<i>Cascabella thevetia</i> (L.) H. Lippold	Apocynaceae	Tree	The leaves and bark were macerated and taken to cure amenorrhea
56	<i>Muntingia calabura</i> L.	Muntingiaceae	Shrub	
57	<i>Catharanthus roseus</i> (L.) G. Don.	Apocynaceae	Herb	The leaves juice are used to headache and wound.
58	<i>Tabernaemontana divaricata</i> (L.) R. Br. ex Roem. & Schult	Apocynaceae	Shrub	Tearing, redness in eye and watering.
59	<i>Calotropis procera</i> (Willd.) Ex W. Ait.	Asclepiadaceae	Shrub	Dysentery, Cold, Cough and Asthma
60	<i>Pergularia daemia</i> (Forsskal) Chiov.	Asclepiadaceae	Climber	Problems during menopause.
61	<i>Trichodesma indicum</i> (L.) Lehm	Boraginaceae	Herb	The leaves of the plant are used to treat cancer
62	<i>Ipomoea obscura</i> (L.) Ker Gawl.	Convolvulaceae	Climber	Treatment of ulcers.
63	<i>Evolvulus alsinoides</i> (L.)	Convolvulaceae	Climber	Brain disorders, epilepsy, nervous problems
64	<i>Datura metel</i> L.	Solanaceae	Herb	Root extract is an astringent, diuretic and used in urinary infections.
65	<i>Solanum torvum</i> Sw.	Solanaceae	Shrub	Dried fruit power is used in eradicate intestinal worms and diarrhoea.
66	<i>Tecoma stans</i> (L.) Juss. ex Kunth.	Bignoniaceae	Tree	The decoction of flowers and bark are used for stomach pains.
67	<i>Millingtonia hortensis</i> L.	Bignoniaceae	Tree	The flowers are added to tobacco for smoking as treatment for throat ailments
68	<i>Pedaliium murex</i> L.	Pedaliaceae	Herb	The plant is considered to be a tonic
69	<i>Ruellia patula</i>	Acanthaceae	Herb	cough, wounds, scalds, toothache, stomach-ache
70	<i>Justicia tranque bariensis</i> Roxb.	Acanthaceae	Shrub	chest diseases, tuberculosis
71	<i>Asystasia gangetica</i> (L.) T. Anderson	Acanthaceae	Herb	To stimulate appetite.
72	<i>Dicliptera paniculata</i> (Retz) Nees.	Acanthaceae	Herb	Decoction given for fever.
73	<i>Lantana camara</i> L.	Verbinaceae	Shrub	Flower paste with coconut oil is applied topically in headache.
74	<i>Leucas aspera</i> (Willd.) Link.	Lamiaceae	Herb	Leaves are boiled and the vapour is inhaled to cure head ache and fever.
75	<i>Ocimum sanctum</i> L.	Lamiaceae	Herb	Common cold, weakness, stress, to treat coughs in children.
76	<i>Boerhavia diffusa</i> L.	Nyctanginaceae	Herb	Root paste is applied topically to treat hydro-testes.
77	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Nyctanginaceae	Herb	Eyesight improvement.
78	<i>Aerva lanata</i> (L.) Juss.	Amaranthaceae	Herb	A decoction of the plant is a reputed diuretic and considered of great value in lithiasis
79	<i>Croton bonplandianum</i> Baill.	Euphorbiaceae	Shrub	Plant extracts controls dropsy and enlargement of abdominal viscera.
80	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Herb	Asthma, respiratory
81	<i>Euphorbia heterophylla</i> L.	Euphorbiaceae	Herb	Stomach problems and to treat dysentery.
82	<i>Jatropha gossypifolia</i> L.	Euphorbiaceae		Leaf extract is used to cure wounds.
83	<i>Acalypha indica</i> L.	Euphorbiaceae	Shrub	Leaf paste is applied topically to treat skin diseases.
84	<i>Commelina benghalensis</i> L.	Commelinaceae	Herb	Leprosy.
85	<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicolson	Araceae	Shrub	Digestion, disease tolerance.
86	<i>Celosia argentea</i> L.	Amaranthaceae	Herb	Flowers are also used in diarrhoea and excessive menstrual discharges
87	<i>Solanum nigrum</i> L.	Solanaceae	Herb	Leaves are taken as food to treat mouth and stomach ulcer and cough.
88	<i>Martynia annua</i> L.	Martyniaceae	Herb	The juice is used as a gargle for sore throat.
89	<i>Ricinus communis</i> L.	Euphorbiaceae	Shrub	The leaf infusion is taken orally or applied to increase lactation in women. The seed-oil is applied on lower stomach to get relief from stomach-ache.
90	<i>Ficus benghalensis</i> L.	Moraceae	Tree	Latex is given to children in fever and dullness.
91	<i>Ficus religiosa</i> L.	Moraceae	Tree	Stem latex is applied topically to heel cracks. Twigs are used as tooth brush.
92	<i>Abutilon crispum</i> (L.) Medik.	Malvaceae	Herb	cough and diabetics
93	<i>Vitex negundo</i> L.	Verbinaceae	Shrub	Cold, cough.
94	<i>Hibiscus rosa sinensis</i> L.	Malvaceae	Shrub	treat bleeding, fever, sore eyes, cough, cold
95	<i>Momordica charantia</i> L.	Cucurbitaceae	Tree	rheumatism and gout
96	<i>Achyranthes aspera</i>	Acanthaceae	Herb	Leaves paste used for some poisonous bites.
97	<i>Spermacoce ocymoides</i> Burm. f.	Rubiaceae	Herb	The leaves are applied in a poultice as a treatment for headache

Discussion

A. Taxonomical study

The collected plants belong to 37 families, 72 genera and 97 species. Dominant families in the study are Malvaceae (7 genera, 11 species), Asteraceae (6 genera, 6 species), Fabaceae (13 genera, 14 species), Euphorbiaceae (5 genera, 6 species). Cucurbitaceae (4 genera, 4 species), Acanthaceae (4 genera, 4 species), Lamiaceae (3 genera, 3 species),

Nyctanginaceae (3 genera, 3 species), Amaranthaceae (3 genera, 3 species), Apocynaceae (3 genera, 3 species), are moderately present in Pavalamalai hill. In our studies the following families are present in low number of species Solanaceae (2 genera, 3 species), Annonaceae (2 genera, 2 species), Cleomaceae (2 genera, 2 species), Meliaceae (2 genera, 2 species), Passifloraceae (2 genera, 2 species), Asclepiadaceae (2 genera, 2 species), Convolvulaceae (2

genera, 2 species).

Phyllanthaceae (1 genera, 2 species), Rhamnaceae (1 genera, 1 species), Papaveraceae (1 genera, 1 species), Sapindaceae (1 genera, 1 species), Zygothymaceae (1 genera, 1 species), Basellaceae (1 genera, 1 species), Combretaceae (1 genera, 1 species), Molluginaceae (1 genera, 1 species), Rubiaceae (1 genera, 1 species), Oleaceae (1 genera, 1 species), Muntingiaceae (1 genera, 1 species), Boraginaceae (1 genera, 1 species), Bignoniaceae (1 genera, 1 species), Pedaliaceae (1 genera, 1 species), Verbinaceae (1 genera, 1 species), Commelinaceae (1 genera, 1 species), Araceae (1 genera, 1 species), Martyniaceae (1 genera, 1 species), Moraceae (1 genera, 1 species), Poaceae (1 genera, 1 species).

B. Vegetative Analysis

In our investigation 49 herbs, 23 trees, 15 Shrubs, 6 Climber, 1 Creeper, are recorded in the study area. The following plants have a great distribution percentage namely, *Cynodon dactylon* (80%), *Evolvulus alsinoides* (77%), *Tridax procumbens* (69%), *Phyllanthus amarus* (63%), *Parthenium hysterophorus* (65%), *Clitoria ternata* (53%), *Achyranthes aspera* (48%), *Euphorbia hirta* (41%), *Justicia tranqbariensis* (32%).

The following plants have a great population percentage namely, *Evolvulus alsinoides* (32%), *Cynodon dactylon* (28%), *Euphorbia hirta* (9.6%), *Tridax procumbens* (4.2%). (Table 1)

Summary

The current taxonomical survey was conducted on a hill called Pavalamalai hill, situated in Gobichettipalayam, Erode, and Tamil Nadu. According to the survey, 97 plant species belonging to 37 families were recorded. Dominant families in the study area were Malvaceae (7 genera, 11 species), Asteraceae (6 genera, 6 species), Fabaceae (13 genera, 14 species), Euphorbiaceae (5 genera, 6 species). Cucurbitaceae (4 genera, 4 species), Acanthaceae (4 genera, 4 species). As per this study work, 49 herbs, 23 trees, 15 Shrub, 6 Climber, 1 Creeper, species are recorded in the study area. *Cynodon dactylon* (80%), *Evolvulus alsinoides* (77%), *Tridax procumbens* (69%) were mostly frequently distributed plant species in the study area.

Conclusion

In our study, the vegetation analysis of Pavalamalai hill was discussed, The study revealed that Fabaceae (13 genera, 14 species) was the dominant family present in the study area. *Cynodon dactylon* and *Evolvulus alsinoides* have the highest population and distribution percentage respectively. There are 97 plants recorded as used for medicinal purposes, 5 plants mentioned as edible.

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