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Research Article

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Ethnomedicinal knowledge among the Malayali tribal of Chitteri hills, Eastern Ghats, Tamil Nadu, India

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ABSTRACT

The present study was aimed to document the ethnomedicinal knowledge among the Malayali tribal of Chitteri hills Eastern Ghats of Tamil Nadu, India. Field visits were made to the Chitteri hills every month covering all seasons. Interviews with traditional healers and other knowledgeable inhabitants and farmers were conducted. The Malayali tribal people of Chitteri hills use 320 plant species for their day-to-day life, this ethnobotanical exploration revealed they were the habit of using around 216 species of medicinal plants belonging to 200 genera under 45families. Malayali tribes use morphological characters such as bark surface, leaf colour, leaf taste and exudates, underground plant parts and ecology of species as criteria for identification of 135 species belongs to 105 genera under 46 families. The documentation of the knowledge of Malayali tribal identification of plants of Chitteri hills is to be accorded top priority in the preservation of our ancient traditional knowledge.

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INTRODUCTION

Traditional knowledge of taxonomy is developed from a basic human tendency to recognize plants that are imposed by nature. It is developed from the unique history and culturally defined beliefs, behaviors and preferences of particular traditional societies rooted in a clearly defined geographical area and transmit their knowledge to their offspring's. The universal identification of plants had been ubiquitous since the evolution of systematic botany. Evolution of taxonomy triggered botanists, to explore variety of plant species universally on their biological properties and evolved into the present modern ethnobotany, which emphasize on their, growth pattern and chemical compositions in traditional communities need. With the passage of time, they have developed a great deal of knowledge on the use of plants and plant products. The tribal have their own scientific knowledge of technology and they are still considered to be primitive and traditional bounded. The knowledge is very dynamic and is strongly influenced by indigenous creativity, innovation, rooted in geographical and cultural cognition. The knowledge is very vulnerable to degradation and even complete loss. In this perspective a rich diversity of flora of Chitteri hills was chosen for the study to document with objectives to reveal the criteria used by the Malayali of Chitteri hills use morphological characters and ecology of species as criteria for identification.

MATERIALS & METHODS

Study Area

The present study area, Chitteri hills, a part of Southern Eastern Ghats, is situated in Pappireddipatti revenue taluk of Dharmapuri district in Tamil Nadu, India. Dharmapuri district has the second highest forest cover in relation to the total geographical area, satisfying the criterion of optimum forest cover of 23.62% in its geographical area. The district accounts for 14.3% of the total forest area of the Tamil Nadu.

Chitteri is situated towards North East of Salem district within the geographical limit of 78°15'-78°45' E, longitude and 11°44'-12°08'N, latitude (Figure-1) and occupies an area of about 654.22 Km^2. Chitteri hills form a compact block consisting of several hill ranges and contain tangled ridges and ravines running in the Northeast and Southwest directions, enclosing many narrow valleys, rivers such as Kallar, Varattar, Kambalai, Anaimaduvu, Kovilar, Sholaiyar and Pungamadauvu rivers and their tributaries drain the area. These rivers are ephemeral in

nature and structurally controlled in their flow. The mean maximum and minimum annual temperatures of the study area are 39.5°C and 19°C, and 31°C and 18°C respectively in winter, average rainfall ranges from 800-1000mm (Harur Forest Office Report, 2007).The Malayali tribes are the most and dominant significant tribes in Chitteri hills of Tamil Nadu. Malayali are the largest Scheduled Tribe constituting 47% of the state scheduled tribal population with a population of 11,482 (Census, 2011). There are 60 villages, out of these, 6 villages are located in plains and 54 villages are located in hill tops.

Field Visits

Field visits were made to the Chitteri hills every month covering all seasons during the period October 2009 – March 2013. Interview and data gathering methods were followed by (Schultes, 1962; Jain, 1995; Rao & Hajra, 1987). Interviews with traditional healers and other knowledgeable inhabitants and farmers were conducted in order to understand how Malayali tribes identify and utilize plants. In addition, we consulted the who is familiar with the study area. Voucher specimens were collected for the purpose of identification and deposited at Vivekanandha College of Arts and Sciences for Women herbarium.

Documentation of Ethnoidentification of Plants Knowledge

The respondents or informants have been selected for the study based on the following criteria, prevalence of ethnobotanical knowledge in villages and willingness of respondents to share the knowledge. All the respondents are men belong to 25 to 85yrs of age group. Most of the respondents are illiterate or even never crossed primary education.

Data were collected from the tribes using two different methods: 1) The knowledgeable informants are taken to the field and collection of plants specimens with uses of the plants and 2) The other way is to collect all plants available in the village, show them to these informants one by one, and record the information about them. The data were gathered in a series of questionnaire, structured, semi-structured and unstructured interviews regarding plant uses, identification during several field trips. Random interviews with a different sub sect of tribal were used to verify data already collected regarding indigenous knowledge for identification of plant species of Malayali tribes of Chitteri hills was documented.

RESULTS AND DISCUSSION

Periodical trips were made to the study area covering all the hamlets in the hills. Such frequent visits to tribal hamlets helped us to establish a good rapport with the natives, which aided us in the collection day today life. Much patience was needed for gathering information from tribes. Only after successive visits the native divulge their knowledge of plants, especially used for medicine and identification. A cordial relationship was established with them and they feel quite at ease in our company. Most of the tribes are illiterate and this rules out the possibility of using questionnaires as means of collecting data, though we prepared questionnaires for ethno medicinal plants and traditional knowledge. Dialogues, conversations and subsequent recording of data are made. The authenticity of the information gathered is verified subsequent field trips to other areas with other persons. Such trips helped in verifying the validity of the other related uses. From such field visits, we recorded that Malayali tribal people of Chitteri hills are in the habit of using 320 species for their day today life.

Enumeration of Ethnobotanical Plants

The present ethnobotanical exploration revealed that the Malayali tribal people of Chitteri hills are in the habit of using around 216 species of medicinal plants belonging to 200 genera under 45families.The families were named as per APG-III classification 2009.

The Malayali tribes of Chitteri hills prefer to use species from their native forest and species from surrounding areas. Among the plants used by them Apocynaceae topping the list with 37 species, Fabaceae (29 species), Acanthaceae and Rutaceae each listed with 16 species. Based on the habit, ethno medicinal plants of Chitteri hills fall under various categories such as trees, shrubs, herbs, climbers and lianas. Among them, trees and herbaceous growth forms dominate over other growth forms.

Identification of Plants by Tribal

Morphological characters

The Malayali tribes use morphological characters and ecology of species as criteria for identification of 135 species (Voucher specimen number from Vi-432 to Vi-567) belongs to 105 genera under 46 families. Morphological characters are often used to recognize plants of which vegetative features are more commonly used than floral features. Malayali tribes also identify plants based on morphological characters with other associated characters such as taste, colour, succulence of leaves and exudates.

Bark characters

The term bark denotes the tissues outside the vascular cambium of the axis, in either a primary or secondary state of growth. In botanical sense bark is that layer of tissue accumulated on the surface of the plant axis as a result of the activity of the phellogen. Bark is an outwardly visible and prominent macro character especially in trees. Malayali use bark characters as the main criterion for identifying tree species with other characters such as nature and colour of leaf and presence or absence of glands as supportive characters.

Bark features such as nature of the surface, thickness of bark and exudates are used by the Malayali as criteria for identification. Among the species, studied Malayali tribal classified 97 species based on bark features without ambiguity (Table 1).

Table 1: Identification of plants with bark characters in Chitteri hills by Malayali tribes

S. No.	Botanical Name	Family	Local name	Bark Characters
1.	*Acacia leucophloea* (Roxb.) Willd.	Fabaceae	Velvelam/Velamaram	Smooth Bark
2.	*Alangium salvifolium* (L.f.) Wang.	Alangiaceae	Azhingi	Rough Bark
3.	*Albizia amara* (Roxb.) Bolvin	Fabaceae	Unzai	Flaked Bark
4.	*Albizia chinensis* (Osbeck.) Merr.	Fabaceae	Selavengi	Rough Bark
5.	*Albizia lebbeck* (L.) Willd.	Fabaceae	Pattaisilai/Vagai	Rough Bark
6.	*Albizia procera* L.	Fabaceae	Kudumaduramaram	Smooth&Thick Bark
7.	*Anacardiu moccidentale* L.	Anacardiaceae	Mundhiri	Rough Bark
8.	*Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guill. &Perr.	Combretaceae	Namaimaram	Flaked & Thick Bark
9.	*Artocarpus heterophyllus* Lam.	Moraceae	Palamaram	Rough Bark
10.	*Atalantia monophylla* (L.) DC.	Rutaceae	KaattuElumichai	Prickled Bark
11.	*Bauhinia tomentosa* L.	Fabaceae	Aachamaram/Pathinimaram	Rough Bark
12.	*Bombax ceiba* L.	Bombacaceae	Ilavu	Prickled Bark
13.	*Bridelia crenulata*Roxb.*Buchanania axillaris* (Desr.) T.P.	Euphorbiaceae	Marivaengai	Rough Bark
14.	Ramamoorthyinc.J.Saldanha& Nicolson	Anacardiaceae	Sulluki/Saraparuppumaram	Rough and Segmented bark
15.	*Canthium dicoccum* (Gaertn.) Teijsm. &Binn.	Rubiaceae	Nekkini	Rough Bark
16.	*Capparis zeylanica* L.	Capparaceae	Athandai	Prickled Bark
17.	*Cassia fistula* L.	Fabaceae	Konnai/Sarakonnai	Smooth & Thick Bark
18.	*Cassia siamea* Lam.	Fabaceae	Thagaraimaram	Smooth Bark
19.	*Ceiba pentandra* (L.) Gaertn.	Bombacaceae	Ilavu	Prickled Bark
20.	*Chloroxylon swietenia* DC.	Rutaceae	Purasamaram	Rough Bark
21.	*Chukrasia tabularis* A. Juss.	Meliaceae	Magombumaram	Rough Bark
22.	*Cleistanthus collinus* (Roxb.) Hook.f.	Euphorbiaceae	Oduvanthazhai	Rough Bark
23.	*Commiphora caudata* (Wight. &Arn.) Engl.	Buseraceae	Pachakiluvai	Smooth& Flaked Bark
24.	*Cordia obliqua*Willd.	Boraginaceae	Vallukumaram	Rough Bark
25.	*Cordia wallichii* G. Don.	Boraginaceae	Panthekku	Rough Bark
26.	*Dalbergia lanceolaria L.*f.	Fabaceae	Eetimaram	Rough Bark
27.	*Dalbergia latifolia*Roxb.	Fabaceae	Eetimaram	Rough &Thick Bark
28.	*Diospyros ebenum* J. Koen. ex Retz	Ebenaceae	Karungali	Roughand Segmented bark
29.	*Diospyros ferrea* (Willd.) Bakh.	Ebenaceae	Irumbuli	Rough Bark
30.	*Diospyros melanoxylon*Roxb.	Ebenaceae	Thumbaranmaram	Rough and Segmented bark
31.	*Diospyros montana*Roxb.	Ebenaceae	Vellungumaram	Prickled Bark
32.	*Diospyros ovalifolia* Wight.	Ebenaceae	Kari maram	Rough Bark
33.	*Erythroxylum monogynum*Roxb.	Erythroxylaceae	Sembulichaan/Devadhaaru	Flaked Bark
34.	*Eucalyptus tereticornis* Smith	Myrtaceae	Thailamaram	Flaked Bark
35.	*Ficus racemosa* L.	Moraceae	Athimaram	Thick Bark
36.	*Ficus benghalensis* L.	Moraceae	Aalamaram	Smooth Bark
37.	*Ficus microcarpa*L.f.	Moraceae	Kalichi	Smooth Bark
38.	*Ficus racemosa* L.	Moraceae	Atthi	Smooth Bark
39.	*Ficus religiosa* L.	Moraceae	Arasamaram	Smooth Bark
40.	*Ficus virens*Ait.	Moraceae	Irali/Maraichi	Smooth Bark
41.	*Filicium decipiens* (Wight. &Arn.) Thwaites	Sapindaceae	Jannimaram	Smooth Bark
42.	*Gardenia gummifera*L.f.	Rubiaceae	Kambimaram	Thick Bark
43.	*Glycyrrhiza glabra* L.	Fabaceae	Athimadhuram	Smooth Bark
44.	*Gmelina arborea*Roxb.	Lamiaceae	Kumizhamaram	Rough Bark
45.	*Grevillea robusta* A. Cunn. ex R. Br.	Proteaceae	Silver rook	Rough Bark
46.	*Gyrocarpus americanus*Jacq.	Hernandiaceae	Thanku	Smooth Bark
47.	*Ixora pavetta*Andr.	Rubiaceae	Koraamaram	Rough Bark
48.	*Lannea coromandelica* (Houtt.) Merr.	Anacardiaceae	Kulimathi/Odhiyamaram	Smooth&Thick Bark
49.	*Ligustrum perrottetii*A.DC.ex DC.	Oleaceae	Pasarmaram	Smooth Bark
50.	*Limonia acidissima* L.	Rutaceae	Vila	Prickled Bark
51.	*Madhuca longifolia* (L.) Machr.	Sapotaceae	Kaatuilluppai	Rough Bark
52.	*Mallotus philippensis* (Lam.) Muell. Arg.	Euphorbiaceae	Thiruchilaimaram	Rough Bark
53.	*Mangifera indica* L.	Anacardiaceae	Maamaram	Rough Bark
54.	*Memecylon edule*Roxb.	Melastomataceae	Allan maram	Rough and Segmented bark
55.	*Mimusop selengi* L.	Sapotaceae	Molluva/Magizhamaram	Rough Bark
56.	*Mitragyna parvifolia* (Roxb.) Korth.	Rubiaceae	Neerkadampai	Flaked Bark
57.	*Morinda coreia*Buch.Ham.	Rubiaceae	Nunamaram	Roughand Segmented bark
58.	*Naringi crenulata* (Roxb.) Nicolson	Rutaceae	Naivila/Porivilangamaram	Rough Bark
59.	*Nothopegia colebrookeana* (Wight.) Blume	Anacardiaceae	Kattumathi/Kattuma	Rough &Thick Bark
60.	*Phyllanthu semblica* L.	Phyllanthaceae	Periyanelli	Smooth Bark
61.	*Pithecellobium dulce* (Roxb) Benth.	Fabaceae	Konakai/Kodukkaaipuli	Rough Bark
62.	*Pittosporumn apaulense* (DC.) Rehder&E.H.Wilson	Pittosporaceae	Vellaimathi	Smooth Bark
63.	*Pleurostylia opposita* (Wall.) Alston	Celastraceae	Sutholingi	Rough Bark
64.	*Plumeria rubra* L.	Apocynaceae	Arali	Smooth Bark
65.	*Polyalthia cerasoides* (Roxb.) Bedd.	Annonaceae	Senthalamaram	Rough and Segmented bark

(Contd...)

Table 1: (*Continied*)

S. No.	Botanical Name	Family	Local name	Bark Characters
66.	*Pongamia pinnata* (L.) Pierre.	Fabaceae	Pungamaram	Rough Bark
67.	*Premna tomentosa* Willd.	Lamiaceae	Ponnari	Rough Bark
68.	*Pterocarpus marsupium*Roxb.	Fabaceae	Vengai	Rough & Thick Bark
69.	*Santalum album* L.	Santalaceae	Santhanam	Rough Bark
70.	*Schleichera oleosa* (Lour.) Oken.	Sapindaceae	Sakattamaram	Rough Bark
71.	*Semecarpus anacardium* L.	Anacardiaceae	Serra maram	Rough & Thick Bark
72.	*Shorea roxburghii* G. Don.	Dipterocarpaceae	Silari/Kungiliyam	Rough &Thick Bark
73.	*Strychnos nux-vomica* L.	Loganiaceae	Yetti	Rough Bark
74.	*Strychno spotatorum* L.	Loganiaceae	Thethamaram	Rough Bark
75.	*Swietenia mahagoni* (L.) Jacq.	Meliaceae	Mahagony	Rough Bark
76.	*Syzgium cumini* (L.) Skeels	Myrtaceae	Naval	Flaked Bark
77.	*Tamarindus indica* L.	Fabaceae	Puliyamaram	Rough Bark
78.	*Tectona grandis* L.f.	Lamiaceae	Thekku	Rough Bark
79.	*Terminalia arjuna* (DC.) Wight. &Arn.	Combretaceae	Neermathi	Smooth, Thick & Flaked Bark
80.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Thandri	Rough & Thick Bark
81.	*Terminaliac hebula*Retz.	Combretaceae	Kadukai	Rough Bark
82.	*Terminalia crenulata* Roth.	Combretaceae	Karumarudhu	Rough and Segmented bark
83.	*Terminalia tomentosa* W. & A.	Combretaceae	Pillaimarudu	Rough & Thick Bark
84.	*Thespesia populnea* (L.) Soland. ex Corrêa	Malvaceae	Poovarasu	Rough Bark
85.	*Thevetia peruviana* K. Schum.	Apocynaceae	Thangaarali	Rough Bark
86.	*Vitex altissima*L.f.	Verbenaceae	Mayiladi	Smooth Bark
87.	Vitex negundo L.	Verbenaceae	Vellainochi	Smooth Bark
88.	Wrightia tinctoria (Roxb.) R. Br.	Apocynaceae	Vetpaalai	Smooth Bark

Rough bark, rough segmented bark, smooth bark, prickled bark, fissured bark and flaked bark are the six different types of bark surfaces recognized by the Malayali in the tree species of Chitteri hills. The trees recorded in the study possess Rough bark and belongs to 50 species, 42 genera under 38 families. The tree possess Smooth bark belongs to 26 species, 23 genera under 17 families. The rough and segmented bark reported in 7 tree species belong to 5 genera under 5 families. The Prickled bark is reported in 6 tree species. The Flaked bark reported in 8species belongs to 8 genera. Malayali identify 19 trees that possess thick bark and. They also identify2 species by inner colour of the bark, they are *Bridelia crenulata* Roxb. and *Pleurostylia opposita* (Wall.) Alston, possess red and white colour inner bark respectively.

Bark has been used as a means of recognition of trees by many tribal societies across the world. For example, the tribes in West Africa classified *Adansonia digitata* L. the Baobab tree into the following four types using bark character such as colour and surface of bark: 1.) Smooth pink bark, 2.) Rough grey bark, 3.) Smooth grey bark and 4.) Black bark (Assogbadjo *et al.*, *2006*). Batoros and Bakigas in Western Uganda recognize trees based on life forms. Identifying trees by their architecture is no problem for them (Kakudidi, 2004).

Modern day field-botanists tend to use vegetative features such as bark characters, leaf characters, overall branching pattern and life form for on-the-spot identification of trees. The above mentioned a few publications in which this approach has been standardized.

Plant Exudates

The secretory spaces in the form of cavities or canals are formed by schizogeny or by lysigeny or sometimes by both phenomena combined. Laticifers are cells or series of fused cells containing fluid called latex and forming systems that permeate various tissues of the plant body.

Any discharge from the plants named as exudates by Malayali tribes of Chitteri hills. They use colour of exudates, change of colour in the exudates and the drying characters of the exudates as important criteria for identifying plant species. Malayali tribes consider the milky and white latex as *pal* in Tamil meaning milky secretion. They recognize 25 milky and white latex yielding plants belonging to 21 genera and 7 families (Table-2). The diversity of habit of these species is trees (14 species), shrubs (3 species), straggler (3 species), climber (3 species) and herb (2 species).Seven species are reported with colourless latex yielding plants, 5 species are reported with red exudates yielding plants. Eight species reported as gum yielding plants and 5 species are resin yielding plants.

For example, the bark of *Pterocarpus marsupium* naturally discharges red coloured latex in a steady continuous flow. Initially it is non viscous and later on it becomes viscous. After a period of 48 hrs, the red coloured latex changes into a semi solid black substance. The bark of *Buchanania axillaris* discharges watery latex very slowly without any cut open, after 2-3 hrs it turns into semi solid. Without any cut open bark steadily discharge of viscous milky latex is characteristic of *Ficus benghalensis*, *F. glomerata*, *F. microcarpa* and *F.religiosa*. The watery latex from the bark of *Cassine glauca* is natural one and turns into semisolid colourless gum in a few hours after discharge. The bark of *Semecarpus anacardium* is cut open, it discharges red coloured exudates very slowly and it turns into a semi solid black mass. On physical contact with the latex is injurious to the skin causing blisters.

The keen observation of the natural phenomena the Malayali tribes of Chitteri hills have is quite surprising. To cite an example,

Table 2: Identification of plants with leaves, exudates and ecological characters in Chitteri hills by Malayali tribes

S. No.	Botanical Name	Family	Local Name	Identification Characters
1.	*Agave angustifolia* L.	Agavaceae	Katarali	Succulence leaves
2.	*Albizia procera* L.	Fabaceae	Kudumadurai	Riparian & Watery latex
3.	*Aloe vera* (L.) Burm.f.	Liliaceae	Katralai	Succulence leaves& Watery latex
4.	*Andrographis alata* (Vahl.) Nees.	Acanthaceae	Siriyanangai	Taste
5.	*Andrographis paniculata* (Burm.f.) Wallich ex Nees.	Acanthaceae	Nilavembu	Taste
6.	*Anogeissus latifolia* (Roxb. ex DC.) Wall. exGuill. &Perr.	Combretaceae	Namaimaram/Vetkaali gum	Colour young leaves & Gum
7.	*Aristolochia indica* L.	Aristolochiaceae	Aduthinapalai	Colour leaves
8.	*Artocarpus heterophyllus* Lam.	Moraceae	Kaatupala	Milky latex
9.	*Artocarpus hirsutus*L.f.	Moraceae	Kari palamaram	Milky latex
10.	*Asparagus recemosa*Willd.	Liliaceae	Thaineervetankizangu	Tuber
11.	*Bombax ceiba* L.	Bombacaceae	Ilavu	Riparian
12.	*Bridelia crenulata*Roxb.	Euphorbiaceae	Marivaengai	Red latex
13.	*Buchanania axillaris* (Desr.) T.P. Ramamoorthyinc. J. Saldanha& Nicolson	Anacardiaceae	Sulluki/Saraparuppumaram	Watery latex
14.	*Calatropis procera* Br.	Apocynaceae	Vellaerukkan	Milky latex
15.	*Calotropis gigantea* (L.) R.Br.	Apocynaceae	Erukkan	Milky latex
16.	*Carulluma adscendens*var. attenuata Wight	Apocynaceae	Kallumullian	Watery latex
17.	*Cassine glauca* (Rottb.) Kuntze	Celastraceae	Eelimaram	Gum
18.	*Catunaregum spinosa* (Retz.) Poiret	Rubiaceae	Marakarai	Root
19.	*Chloroxylon swietenia* DC.	Rutaceae	Purasamaram	Watery latex
20.	*Clerodendrum inerme* (L.) Gaerrtner	Verbenaceae	Nar SanguIllai	Taste of leaves
21.	*Cordia wallichii* G. Don.	Boraginaceae	Panthekku	Watery latex
22.	*Cosmostigma racemosum* (Roxb.) Wight	Apocynaceae	Padameratti	Milky latex
23.	*Crateva magna* DC.	Capparaceae	-	Tuber
24.	*Croton bonplandianus* Ballion	Euphorbiaceae	Poondu	Watery latex
25.	*Cryptolepis grandiflora* Wight.	Apocynaceae	Attankodi/Matangodi	Milky latex
26.	*Curculigo orchioides*Gaertner	Hypoxidaceae	Nilapanaikilangu	Tuber
27.	*Decalepis hamiltoni* Wight. &Arn.	Apocynaceae	Mavilangum	Tuber & Milky latex
28.	*Dioscorea pentaphylla* L.	Dioscoreaceae	Vallikilangu	Tuber
29.	*Dioscorea bulbifera* L.	Dioscoreaceae	Kavalaikizangu	Tuber
30.	*Dioscorea oppositifolia* L.	Dioscoreaceae	Malaiyankilangu	Tuber
31.	*Diospyrosferrea* (Willd.) Bakh.	Ebenaceae	Irumbuli	Gum
32.	*Drynaria quercifolia* (L.) J. Sm.	Polypodiaceae	Attukaalkilangu	Tuber
33.	*Eucalyptus tereticornis* Smith	Myrtaceae	Thailamaram	Gum
34.	*Euphorbia antiaquorum*L.	Euphorbiaceae	Sathurakalli	Milky latex
35.	*Euphorbia herterophylla* L.	Euphorbiaceae	Venmaikolunthu	Milky latex
36.	*Ficus benghalensis* L.	Moraceae	Alamaram	Milky latex
37.	*Ficus glomerata* Roxb.	Moraceae	Athimaram	Milky latex
38.	*Ficus infectoria* Willd.	Moraceae	Malaiitchi	Milky latex &Riparian
39.	*Ficus microcarpa* L. f.	Moraceae	Kalarasan	Milky latex
40.	*Ficus racemosa* L.	Moraceae	Atthi	Milky latex & Riparian
41.	*Ficus religiosa* L.	Moraceae	Arsamaram	Milky latex
42.	*Flueggela virosa* (Willd.) Baillon	Euphorbiaceae	-	Colourleaves
43.	*Gardenia gummifera* L.f.	Rubiaceae	Kambimaram	Resin
44.	*Gardenia resinifera* Roth.	Rubiaceae	Kambimaram	Resin
45.	*Grevillea robusta* A. Cunn. ex R. Br.	Proteaceae	Malaisavuku	Resin
46.	*Gymnema sylvestre* (Retz.) R.Br.ex Roemer &Schultes	Apocynaceae	Sirukurinjan	Milky latex &Taste of leaf
47.	*Hardwickia binata*Roxb.	Fabaceae	Achamaram	Resin
48.	*Hemidesmus indicus* (L.) R.Br.	Apocynaceae	Sirumolikizhangu	Tuber & Milky latex
49.	*Hiptage benghalensis* (L.) Kurz.	Malpighiaceae	Suthalakodi	Leaf Glands
50.	*Icnocarpus rutescens* (L.) R.Br.	Apocynaceae	Palvallikodi	Milky latex
51.	*Limonia acidissima* L.	Rutaceae	Vila	Gum
52.	*Litsea oleoides* (Meissner) Hook. f.	Lauraceae	-	Colour leaves
53.	*Madhuca longifolia* (L.) Machr.	Sapotaceae	Kaatuilluppai	Milky latex, Colour leaves&Riparian
54.	*Maerua ablongifolia* (Forsskal) A.Rich.	Capparaceae	Pumisarkaraikizhangu	Tuber
55.	*Mallotus philippensis* (Lam.) Muell. Arg.	Euphorbiaceae	Thiruchilaimaram	Leaf Glands
56.	*Mangifera indica* L.	Anacardiaceae	Ma	Riparian
57.	*Manilkara hexandra*Dubard	Sapotaceae	-	Riparian
58.	*Marsdenia tenacissima* (Roxb.) Moon	Apocynaceae	-	Watery latex
59.	*Mimusops elengi* L.	Saptoaceae	Mulavumaram	Milky latex
60.	*Mirabilis jalapa* L.	Nyctaginaceae	Anthimantharai	Tuber
61.	*Mitragyna parvifolia* (Roxb.) Korth.	Rubiaceae	Neerkadapai	Riparian & Red latex
62.	*Morinda coreia*Buch.Ham.	Rubiaceae	ManjalKadapai/Nuna	Riparian & Gum
63.	*Musa paradisiacal* L.	Musaceae	Valai	Tuber
64.	*Nerium olender* L.	Apocynaceae	Alari	Milky latex

(Contd...)

Table 2: (*Continied*)

S. No.	Botanical Name	Family	Local Name	Identification Characters
65.	*Pavonia zeylanica* (L.) Cav.	Malvaceae	Sitramutti	Root
66.	*Pentatropsis capensis* (T.f.) Bullock	Apocynaceae	Uppalankodi	Watery latex
67.	*Pergularia daemia* (Forsskal) Chiov	Apocynaceae	Uthaamanai	Milky latex
68.	*Plecospermum spinosum* (Roxb. ex Willd.) Trecul.	Moraceae	-	Milky latex
69.	*Plumeria rubra* L.	Apocynaceae	Arali	Milky latex
70.	*Polyalthia cerasoides* (Roxb.) Bedd.	Annonaceae	Senthalamaram	Red latex
71.	*Pongamia pinnata* (L.) Pierre	Fabaceae	Pungan	Riparian
72.	*Premna tomentosa*Willd.	Verbenaceae	Ponneri	Colour leaves
73.	*Pterocarpus marsupium*Roxb.	Fabaceae	Vengai	Red latex
74.	*Semecarpus anacardium* L.	Anacardiaceae	Serra maram	Red latex, Taste & Colour leaves
75.	*Shorea roxburghii*G. Don.	Dipterocarpaceae	Silari/Kungiliyam	Gum
76.	*Syzgium cumini* (L.) Skeels	Myrtaceae	Naval	Riparian
77.	*Tephrosia purpurea* (L.) Pers.	Fabaceae	Kozingi	Root
78.	*Terminalia arjuna* (DC.) Wight. &Arn.	Combretaceae	Neermathi	Riparian, Resin & leaf Glands
79.	*Terminalia bellerica* (Gaertner) Roxb.	Combretaceae	Thandrikaai	Riparian
80.	*Terminalia crenulata* Roth.	Combretaceae	Karumarudhu	Riparian & Gum
81.	*Terminalia tomentosa* W. & A.	Combretaceae	Pillaimarudu	Leaf Glands
82.	*Tylophora indica* (Burmit) Merr.	Apocynaceae	Kuthupalai	Milky latex
83.	*Vitex negundo* L.	Verbenaceae	Notchi	Riparian & Colour leaves
84.	*Withania somnifera* (L.) Duanl	Solanaceae	Amakarankilangu	Root
85.	*Wrightia tinctoria* (Roxb.) R.Br.	Apocynaceae	Veppalai	Milky latex

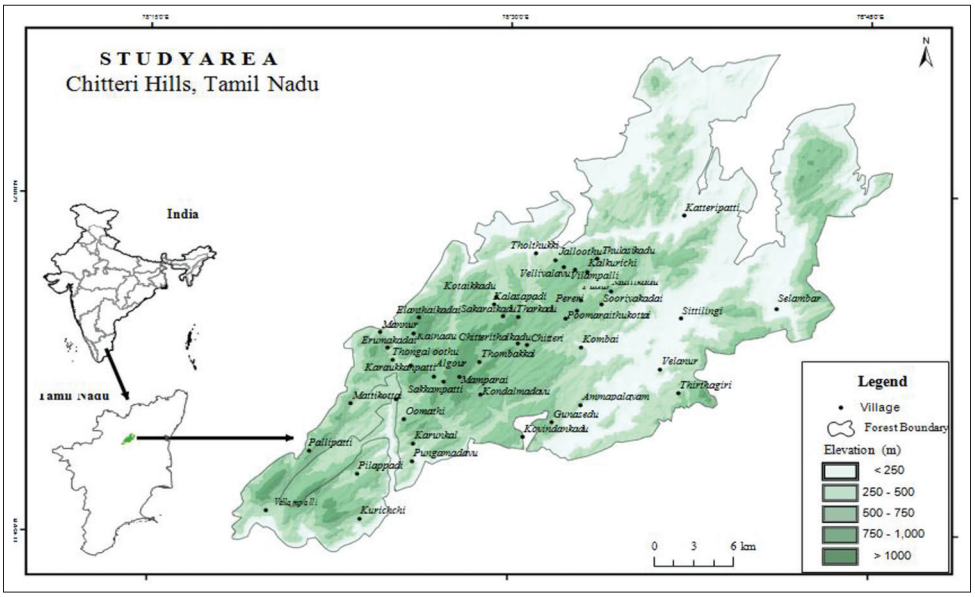

Figure: 1 Study area

the Malayali explain the periodicity of the flow of latex thus: "The rate of flow of latex from the trees is influenced by rainfall. If the species receives sufficient rainfall, the discharge of latex is copious and if the species receives insufficient rainfall, the discharge of latex is scanty". The scientific explanation for this phenomenon is as follows: "Under conditions of heavy rainfall, the cells are supersaturated with water resulting in increased turgour within the plant body. This leads to copious discharge of latex. On the other hand under conditions of drought or scanty rainfall, the cells become flaccid resulting in scanty discharge of the latex". Though they may not know the scientific basis for this phenomenon, it must be agreed that their observation is correct.

Leaf characters

Many tribes familiar with plants use sight, touch, taste, smell and sound for identification and classification of particular plant species. Tribal experience with the organoleptic properties of plants in identification comprises smell, touch and taste (Newmaster *et al.*, 2006). Sensory perception gained by experience is an important tool for plant identification (Getchell *et al.*, 1991; Messer, 1991).

The taste qualities that humans perceive in plants, especially bitterness, have been proposed as significant clue used in primitive societies. Malayali of Chitteri hills have clear knowledge of identification of the species in which leaf characters such as colour, taste, smell, succulence and glands form important criteria.

The Malayali of Chitteri hills also use their personal experience of taste for identification of certain species of plants. By experiencing the leaf taste they identified the following plants *Andrographis paniculata*, *Andrographis alata*,, *Gymnema*

sylvestre, *Semecarpus anacardium*, *Albizia procera*,,*Ceropegia juncea* and *Clerodendrum inerme*. Of the aforementioned plant species, the leaves of *Andrographis alata*, *Andrographis paniculata*, *Clerodendrum inerme* and *Semecarpus anacardium* are bitter to taste.

The leaves of *Gymnema sylvestre* also bitter to taste. However, the leaves also have a property of rendering the taste buds neutralized so that the person who has chewed the leaves cannot taste the sweetness for quite a few hours. The tribal people gave jaggery to the present author after a bout of chewing a few leaves of *Gymnema sylvestre* and the experience were like having a mouthful of sand. The case of *Ceropegia juncea* locally called "*Sempulichan*" is more interesting. The taste of the stem changes, in the morning hours tastes is sour, during the noon hours, it is bitter and in the evening hours it is acidic taste.

The Malayali identify / recognize *Terminalia tomentosa*, *Hiptage benghalensis*, *Mallotus philippinensis* and *Terminalia arjuna* by the presence of glands. In fact, the vernacular name for *Terminalia tomentosa* is "*pillai maruthu*" in which the epithet '*maru*' means mole. The glands often resemble 'mole'.

Colour of the leaf is another morphological criterion to distinguish between species. Malayali tribes identified eight species by leaf colour is either brown or rusty or black or copper coloured depending on the species. They are *Madhuca longifolia* (Red colour at new foliage), *Anogeissus latifolia* (Coppery colour at new foliage), *Semecarpus anacardium* (rusty colour below), *Premna tomentosa* (Yellow colour), *Vitex negundo* (grey pubescent colour), *Litsea oleoides* (brown colour), *Aristolochia indica* (whitish colour) and *Flueggela virosa* (coppery colour in tender foliage).

They identified two species by the succulence of their leaves; they are *Aloe vera* and *Agave angustifolia*. The taste and smell are criteria of medicinal and non-medicinal plants. Non-medicinal plants were more often reported to have no smell (or) taste (Classen, 1992). Taste is important in Mayan tribal medicinal plant classification, but are most likely used in combination with other markers. Taste is traditionally viewed as a mixture of four elementary qualities salty, sweet, sour and bitter. For example, plants, in the sunflower family (Asteraceae) have bitter taste because of high level of alkaloid content. This hypothesis is supported by observations of Chimpanzees using bitter Asteraceae species for treating gastro-intestinal disorders. From this observation Highland Maya tribe often treat gastro-intestinal disorders with plants that are bitter (Berlin, 1992). A majority of plants are selected for medicinal use based on the property such as taste and smell. Good smelling plants are used against stomach, bitter tasting plants are applied topically for skin problems and sweet plants are given to strengthen the body and the blood (Heinrich & Gibbons, 2001).

Tuberous and Rhizomatous plants

Malayali tribes of Chitteri hills identified underground parts of the plant species by utility. They used 19 underground plant parts belonging to 16 genera under 15 families. Roots, rhizome and tuber of these plants are used for preparing raw drug to cure ailments and food. Of these 19 species, 5 are used as food, the rest are used for medicinal properties.

Rhizomes of *Dioscorea bulbifera*, *Dioscorea pentaphylla* and *Dioscorea oppositifolia* are cooked and eaten. Roots of *Decalepis hamiltonii* are pickled and used as food adjuvant. The roots of *Hemidesmus indicus* yield a coolant drink called '*Nannari sharbath*'.

The Malayali tribal have a wide knowledge of conserving plant species. They adopt specific strategies while harvesting plant parts for their use. For example while collecting the *Dioscorea* sp. they know at what stage of plant growth the rhizome is to be dugout. Based on plant and leaf growth, a Malayali knows whether the rhizome is mature or immature. They are also conscious of conserving the plant for posterity. While digging out the rhizome, they leave out some portion of rhizome with bud (called as "*Moodi*" in Tamil) so that it can grow in next season. This practice protects the species from extinction. They roast or boil the rhizome for consumption. The upper portion of rhizome is not used in cooking, as it cause itching sensation.

The roots of *Decalepis hamiltoni* is collected, washed with water, cut into small pieces and dried in the sun. The dried root pieces are pickled. Roots of *Hemidesmus indicus*is collected, washed with water and crushed freshly to prepare a coolant drink called '*Nannari sharbath*'Malayali tribes of Chitteri hills and tribes of various regions use underground parts for their sustainable use. Tribes of Kadars, Malasars, Maduvars and Malamalaasars of Parambikulam wild life sanctuary, Kerala, listed ten edible underground parts of rhizome, tuber, corms and bulbs for cooking curry. The rhizome of *Dioscorea* sp. causes terrible itching sensation in ones throat if eaten raw. They peel off the outer layer, boil the rhizome in tamarind water and smear with turmeric paste to make it palatable (Yesodharan & Sujana, 2007).

Today we know that raphides (the needle like crystals) of calcium oxalate present in the parenchyma cells of the tubers prick the tongue and mouth causing irritation. When soaked and cooked with tamarind, the tannic acid present in tamarind dissolves the crystals. It is surprising as to how the tribal people knew of the use of tamarind for this purpose.

Ecological characters

Ecological knowledge, such as where a particular plant lives is another important criterion used by the tribes for identifying plants and is perhaps limited to the geographic region. Ecology appears to play an important role in how people classified the flora and fauna of a given area (Areendran & Rao, 2009).

Malayali tribes use landscape characters to a greater extent for identifying certain species of plants. They have accurate knowledge about species such as *Ficus tomentosa*, *Caralluma attuneta* and *C. umbellata* occurring in rocky terrains. Malayali tribes are knowledgeable about connecting certain species to

the particular landscape and naming the species accordingly. The naming of plant in vernacular language is based on habitat; one typical example is *Caralluma attuneta* which is locally called *kallumuliyan* in Tamil, because this species always occurs in rocky areas.

Albizzia procera an exotic plant that occurs very rarely in Chitteri hills is another good example for this. The bark of this tree, which is used to cure all types of bone fractures, is called *Koodumathurai* in Tamil. The Tamil word *Koodu* means meeting or group and 'to join'. This species always occurs in a group of three to five. Its medicinal property joins fractured bones as well. Therefore, the Tamil vernacular name appears appropriate. *Decalepis hamiltoni* of Apocynaceae is another species growing in rocky areas. Malayali always look for this plant in rocky areas as their root tubes pickled as consumed as food adjuvant. The tubers have cooling properties.

To cite some more examples on their knowledge of the habitat characteristic of plants, they recognize the following plants as riparian. The field notes of the following species: *Terminalia arjuna* is characteristic riparian (riverbanks) (Matthew, 1995). According to Gamble it is more scarce in Carnatic region except in Tirunelveli and on the West coast; on the banks of rivers and streams. *Terminalia crenulata*is reported as occasional in riverbanks (Matthew, 1995), *Syzygium cumini* is representing variety of habitats: Shoals, riverbanks, scrub jungle (Matthew, 1995). It occur in all forest districts, both in plains and in the hills up to 6000 ft., usually along river banks and in moisture localities (Gamble & Fisher, 1935).

Vitex negundo is common in riverbanks or fencing near households (Matthew, 1995). It is present in the dry region up to 5000ft in the hills, on wastelands around villages, on roadsides and the banks of streams, common (Gamble & Fisher, 1935). *Bombax ceiba* occur from plains to coast, especially along riverbanks; on the deciduous belt of the hills to 800m (Matthew, 1995), *Drosera indica* is bloom up with the monsoons (unless in perennially moist ground) (Matthew, 1995) and wet places in hills. According to Gamble *Mangifera indica*, occurs in ravines up to 4000ft. *Mitragyna parvifolia* is often reported along rivers and foothills to 800m (Matthew, 1995). *Pongamia pinnata* represent mostly by banks of rivers, in ravine (Matthew, 1995). It is present from coastal forest to tidal riverbanks; inland chiefly along streams and rivers in most districts in the hills up to 3000ft (Gamble & Fisher, 1935) attests to their riparian nature.

Just as a field-botanist has his own scientific approach towards identifying plants in order to pick useful ones, native tribes also have their own approach based on direct observation and macro characters and this serves the purpose. Therefore, we should not dismiss the traditional knowledge of the tribal people as something without scientific basis.

In conclusion, the identification of the usefulness of a plant by organoleptic characters as practiced by the tribal people around the world may be a simple and useful tool to those who do not have a formal botanical training. This knowledge is transmitted orally from generation to generation in the tribal population. Though for scientific purposes this approach of identification of plants cannot be the sole basis, it is certainly useful as it offers supportive field characters for confirming identification. In this context, it is recommended that such indigenous knowledge is documented and incorporated in the floristic publications of the regional floras.

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