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Medicinal plants viz a viz indigenous knowledge among the tribals of Pachamalai Hills

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An ethnobotanical survey was carried out in Pachamalai Hills to document Indigenous Knowledge (IK) Management at Pachamalai, rich in both cultural and biodiversity rich area. The tribal women and men of this hill are well known for their knowledge of the medicinal properties of the endemic flora. They have been using specific medicinal plants to cure specific ailments over centuries. The knowledge of the tribal people associated with the treatment of various animal diseases, crop pest management and human cure using medicinal plants is fast disappearing due to urbanization and modernization and tendency to gradual migration to the mainstream. There is an urgent need to study and document the existing knowledge for posterity. This paper presents information on indigenous knowledge associated with the use of plant species to cure animal, human and crop pest and disease management practice followed by *Malayali* tribals.

Keywords: Biodiversity hotspots, Healthcare, *Malayali* tribals, Pachamalai Hills, Tamil Nadu

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Out of the 35 biodiversity hotspots listed in the world, two are located with in the Indian Sub continent of which the Western Ghats is one, and the Eastern Himalayas (part of the Indo-Burma Biodiversity hotspot) is the others[1,2]. The Western Ghats also figures as one of the 8 hottest biodiversity hotspots in the world. When compare it with the Western Ghats, there has been only limited studies recorded in the Eastern Ghats. This study was undertaken since no attention has been paid so far to document the indigenous knowledge (IK) available with the tribal who lives in Pachamalai Hills[3-5]. The Pachamalai Hills spread over tow districts namely, Salem and Tiruchirapalli in Tamil Nadu is about 75 km away from Tiruchirapalli city. This hill is situated in the southern parts of the Eastern Ghats (Fig. 1). Its elevation ranges from 400-1,200 m above Mean Sea Level. The forest comprises of tropical thorny, dry deciduous and moist deciduous types of vegetation (Fig. 2). Total geographical area of hill Pachamalai is 14,277 ha. The survey covers Kombai, Thenparanadu, Vannadu (Tiruchirapalli district) and Pachamalai (Salem district). Out of 81 villages in this region, only 30 villages were selected for the study.

Methodology

The methods adopted for collection of data was interviews with the tribals, observations, interaction with local *Panchayats*, Forest Officials and NGOs working in and around Pachamalai Hills (Figs. 3-5). The collected information on the indigenous knowledge associated with plant resources are compiled in the form of database. The plant voucher specimens were deposited with the Community Herbarium located at MSSRF, Chennai.

Results

Distinction of some plants as 'medicinal plants' conveys an important association between these plants and a set of traditional knowledge on their use in medicinal preparations to treat people, livestock or plants. The communities over the years through trial and error have established the traditional knowledge or Indigenous Knowledge (IK) on the application of different species, their specific part, their specific combinations and a specific way of formulation and application. The traditional knowledge on application of plants for different medicinal uses that has evolved and is currently maintained is largely determined by the locally available biodiversity, both in the past and the present. The study areas in Tiruchirapalli and Salem situated in the Eastern Ghats are fairly rich in biodiversity and many of the plant species used in various medicinal formulations are either

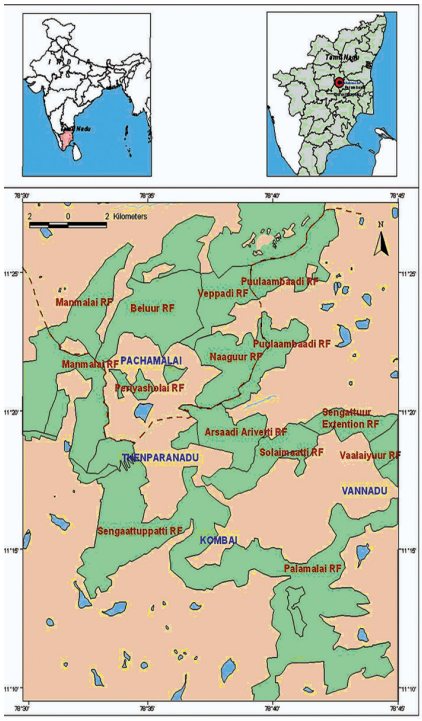


Fig 1 Location map of Pachamalai hills

Fig 2 Over view of Pachamalai hills

Fig 3 Plant specimen collection

Fig 4 IK on Animal disease

Fig 5 IK on human disease

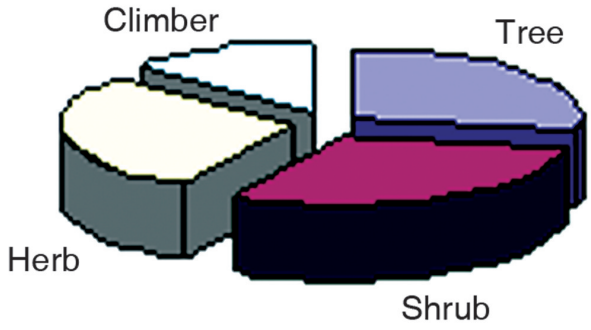


Fig 6 Distribution of plant habit in animal healthcare

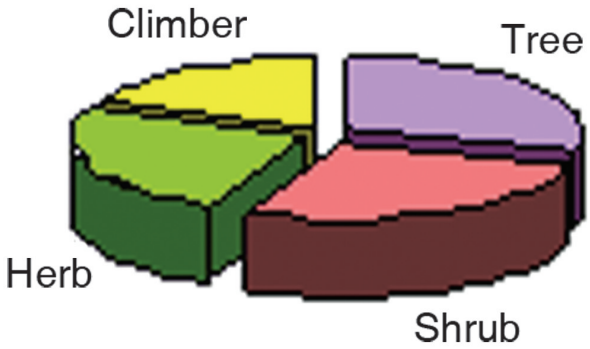
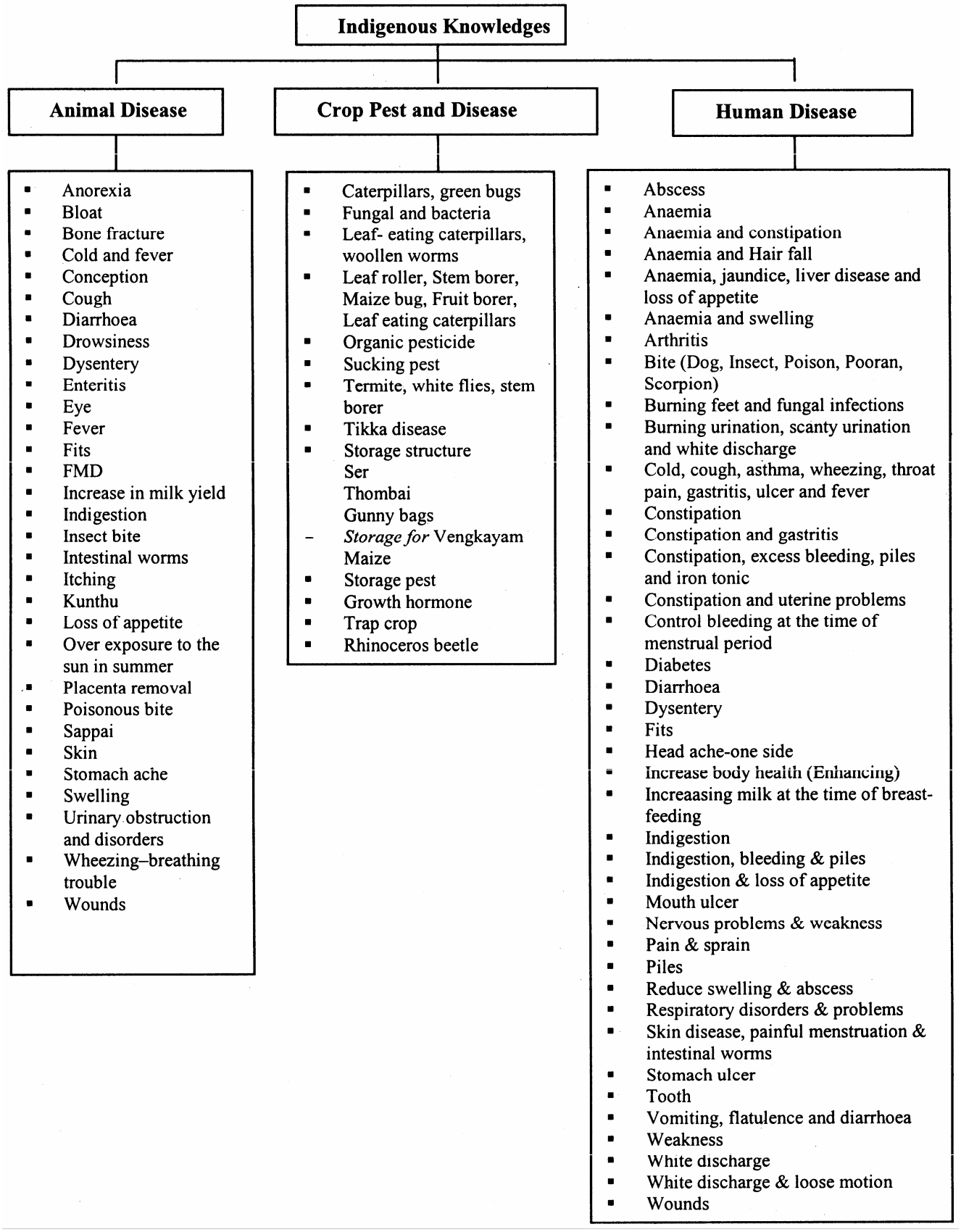


Fig 7 Distribution of plant habit in human healthcare

naturally existing or are cultivated here and have been for a long time. The climate and soil of the region also have an important bearing on the local ecosystem and its component species as well as genetic diversity, both in the case of natural flora as well as in the cultivated crops. The communities involved in this study are largely traditional, who are still practicing much of their knowledge for day-to-day applications, mainly in the realm of healthcare.

The results of the study showed abundance of Indigenous Knowledge available among the local communities in the study area, the diverse plant species, and wild and cultivated, used for equally diverse medicinal preparations and the perception of individuals and communities on the efficacy of a medicinal formulation. The community revealed some of the details only after considerable confidence building with the objectives of the study and on the safety of disclosure. The survey showed that nearly 119 medicinal plant species associated with the 84 Indigenous Knowledge to treat animal diseases, human ailment and crop pest and diseases. These 84 indigenous knowledge includes total of 189 medicinal formulations. The study briefly described that the indigenous knowledge were 31 for animal diseases, 13 for crop pest and diseases and 40 to treat various human ailments.


Indigenous Knowledges
Animal Disease
Crop Pest and Disease
Human Disease
Anorexia
Bloat
Bone fracture
Cold and fever
Conception
Cough
Diarrhoea
Drowsiness
Dysentery
Enteritis
Eye
Fever
Fits
FMD
Increase in milk yield
Indigestion
Insect bite
Intestinal worms
Itching
Kunthu
Loss of appetite
Over exposure to the sun in summer
Placenta removal
Poisonous bite
Sappai
Skin
Stomach ache
Swelling
Urinary obstruction and disorders
Wheezing–breathing trouble
Wounds
Caterpillars, green bugs
Fungal and bacteria
Leaf- eating caterpillars, woollen worms
Leaf roller, Stem borer, Maize bug, Fruit borer, Leaf eating caterpillars
Organic pesticide
Sucking pest
Termite, white flies, stem borer
Tikka disease
Storage structure
Ser
Thombai
Gunny bags
– Storage for Vengkayam Maize
Storage pest
Growth hormone
Trap crop
Rhinoceros beetle
Abscess
Anaemia
Anaemia and constipation
Anaemia and Hair fall
Anaemia, jaundice, liver disease and loss of appetite
Anaemia and swelling
Arthritis
Bite (Dog, Insect, Poison, Pooran, Scorpion)
Burning feet and fungal infections
Burning urination, scanty urination and white discharge
Cold, cough, asthma, wheezing, throat pain, gastritis, ulcer and fever
Constipation
Constipation and gastritis
Constipation, excess bleeding, piles and iron tonic
Constipation and uterine problems
Control bleeding at the time of menstrual period
Diabetes
Diarrhoea
Dysentery
Fits
Head ache-one side
Increase body health (Enhancing)
Increaasing milk at the time of breast-feeding
Indigestion
Indigestion, bleeding & piles
Indigestion & loss of appetite
Mouth ulcer
Nervous problems & weakness
Pain & sprain
Piles
Reduce swelling & abscess
Respiratory disorders & problems
Skin disease, painful menstruation & intestinal worms
Stomach ulcer
Tooth
Vomiting, flatulence and diarrhoea
Weakness
White discharge
White discharge & loose motion
Wounds

Distribution of species involved

The vernacular name and botanical name of plants, family name and uses to cure various animal, crop and human diseases are listed (Table 1). The data were further subjected to close examination and use of each species under one or more groups and the relationship among these trans-sectional uses were mapped. The results of this analysis showed that 40 among the 119 plant species are used exclusively in the formulations used for the animal healthcare, while the total animal healthcare formulations documented by the study are 92 under 31 subjects matter. Similarly, 15 plant species are used exclusively in the formulations for human healthcare, while the total human healthcare formulations documented are 69 under 40 subjects matter. Only 7 plant species are exclusively used in the formulations for crop protection, while the total crop protection formulations are 30 under 13 subjects matter. With 62 plant species exclusively used under three sections, 57 plant species are used across these sections either in any of the two or in all the three. Results showed that 18 plant species belonging to 15 families are used in formulations concerning the healthcare of animals, human and crop plants (Table 2). Another interesting aspect of the use of same plant species in formulations across two sections is that the formulations concerning animal and human healthcare shared more commonality than between animal and crop or human and crop.

Distribution of plant habits

Examinations of the 95 species, which are associated with IK on animal healthcare, for their growth habit showed that majority of them (29.5%) are shrubs (Fig. 6). The next major groupings are those with tree habit (28.4%), followed by those with herb habit (28.4%) and climber habit (13.7%). The species used in IK formulations for treating human health problems were further examined for their growth habit. The results of the study showed that among these species, 19 have tree habit and they belonged to 14 families, while the next largest numbers of species (18) have shrub habit and belonged to 13 families. Another 16 species have herb habit and belonged to 12 families. Only 12 species have climber habit. In other words, 27.7% of the species are shrubs, 29.2% are trees, 24.6% are herbs and 18.5% are climbers (Fig. 7).

Distribution of plant parts

While treating the animal diseases, only in two cases the whole plant is used. These species are either annual climber or herb. Leaves are most predominantly used followed by bark, fruits, seeds and roots, in that order. Use of leaves had occurred 44 times, while that of bark 35 times, fruits 19 times, seeds 14 times, roots 10 times, bulbs 7 times, flowers, rhizomes, and tubers 4 times each in the formulations pertaining to 31 subject matter on the management of animal health. For the treatment of different disorders, either the same part of different species (e.g. leaves bark of four species to treat stomachache and of two species to treat breathing problem) or different parts of different species are used. Occasionally, different parts of the same species are chosen for curing different disorders (e.g. fruits of *Tamarindus indica* is used to cure urinary obstruction and *kunthu* and its leaf are used for conception and placenta removal). At the time of treating crop pest and diseases, few of the species such as *Azadirachta indica*, *Pongamia pinnata* and *Aloe vera* are used more frequently. The most widely used plant part is the leaf followed by bark, whole plant, seed, bulb, stem, leaf sheath, and seed. The frequency of use of these plant parts from different species in the 31 formulations is five times in whole plant, 44 times for leaf, five times for whole plant, 6 times for bark, bulb, rhizome and seed each one time.

Table 1 — Mapping of species deployment in formulations

Vernacular name	Plant Species	Family Name	A	C	H
Adathoda	*Justicia adhatoda* L.	*Acanthaceae*	✓	✓	-
Siriyanangai	*Andrographis paniculata* (Burm.f.) Wallich ex Nees	*Acanthaceae*	✓	-	✓
Alinji	*Alangium salviifolium* (L.f.) Wangerin	*Alangiaceae*	✓	-	-
Mullukeerai	*Amaranthus spinosus* L.	*Amaranthaceae*	✓	-	✓
Nayuruvi	*Achyranthes aspera* L.	*Amaranthaceae*	✓	-	✓
Sirukeerai	*Amaranthus tricolor* L.	*Amaranthaceae*	-	-	✓

Contd —

Table 1 — Mapping of species deployment in formulations — *Contd*

Vernacular name	Plant Species	Family Name	A	C	H
Seetha	*Annona squamosa* L.	*Annonaceae*	✓	✓	✓
Kothamalli	*Coriandrum sativum* L.	*Apiaceae*	✓	-	-
Arali	*Nerium oleander* L.	*Apocynaceae*	✓	✓	-
Kalakka	*Carissa carandas* L.	*Apocynaceae*	✓	-	✓
Nithyakalyani	*Catharanthus roseus* (L.) Don	*Apocynaceae*	✓	-	✓
Seppankizhangu	*Colocasia esculenta* (L.) Schot	*Araceae*	✓	-	-
Vasambu	*Acorus calamus* L.	*Araceae*	✓	✓	✓
Panai	*Borassus flabellifer* L.	*Arecaceae*	✓	-	-
Thennai	*Cocos nucifera* L.	*Arecaceae*	✓	✓	-
Adutheendapalai	*Aristolochia bracteolata* Lam.	*Aristolochiaceae*	✓	✓	✓
Thalaisurili	*Aristolochia indica* L.	*Aristolochiaceae*	✓	-	✓
Erukku	*Calotropis gigantea* (L.) R.Br.	*Asclepiadaceae*	✓	✓	✓
Kodikali	*Sarcostemma acidum* (Roxb.)	*Asclepiadaceae*	-	-	✓
Sirukurinjan	*Gymnema sylvestre* (Retz.) R.Br.ex Roemer & Schutles	*Asclepiadaceae*	✓	-	✓
Veliparuthi	*Pergularia daemia* (Forsskal) Chiov.	*Asclepidaceae*	✓	-	-
Karisalangani	*Eclipta alba* L.	*Asteraceae*	-	-	✓
Parthenium	*Parthenium hysterophorus* L.	*Asteraceae*	-	✓	-
Moongil	*Bambusa arundinacea (Retz.) Willd.*	*Bambusaceae*	✓	-	-
Pasalai	*Basella alba* L.	*Basellaceae*	-	-	✓
Illavam	*Ceiba pentandra* (L.) Gaertner var. *pentandra*	*Bombaceae*	✓	-	-
Seruppadai	*Coldenia procumbens* L.	*Boraginaceae*	-	-	✓
Kalli	*Opuntia dillenii* (Ker Gawler) Haw.	*Cactaceae*	✓	-	-
Aavaaram	*Cassia auriculata* L.	*Caesalpiniaceae*	✓	-	✓
Konna	*Cassia fistula* L.	*Caesalpiniaceae*	✓	✓	✓
Puli	*Tamarindus indica* L.	*Caesalpiniaceae*	✓	-	✓
Seemaiagathi	*Cassia alata* L.	*Caesalpiniaceae*	✓	-	-
Athandai	*Capparis divaricata* Lam.	*Capparaceae*	✓	-	✓
Viluthi	*Cadaba fruticosa* (L.) Druce	*Capparaceae*	✓	-	✓
Pappali	*Carica papaya* L.	*Caricaceae*	-	✓	✓
Kaddukai	*Terminalia chebula* Retz.	*Combretaceae*	✓	-	✓
Kovakka	*Coccinia grandis* (L.) J.Voigt	*Cucurbitaceae*	-	-	✓
Kumati	*Citrullus colocynthis* (L.) Schrader	*Cucurbitaceae*	✓	-	✓
Pagarkai	*Momordica charantia* L.	*Cucurbitaceae*	✓	-	-
Vellari	*Cucumis sativus* L.	*Cucurbitaceae*	-	✓	-
Vakkanathi	*Diospyros montana* Roxb.	*Ebenaceae*	✓	-	-
Amanakku	*Ricinus communis* L.	*Euphorbiaceae*	✓	✓	✓
Karumpulan	*Securinega virosa (*Willd.) Baillon	*Euphorbiaceae*	✓	-	-
Kuppaimeni	*Acalypha indica* L.	*Euphorbiaceae*	✓	-	-
Nelli	*Phyllanthus emblica* L.	*Euphorbiaceae*	✓	-	-
Oduvan	*Cleistanthus collinus* (Roxb.) Benth.ex.Hook.f.	*Euphorbiaceae*	✓	✓	-
Avuri	*Tephrosia purpurea* (L.) Pers.	*Fabaceae*	✓	-	✓
Kollu	*Macrotyloma uniflorum* (Lam.) Verdc.	*Fabaceae*	✓	-	-
Kundumani	*Abrus precatorius* L.	*Fabaceae*	✓	-	✓
Mochai	*Lablab purpureus* (L.) Sweet var. *purpureus*	*Fabaceae*	✓	-	-
Poonaikali	*Mucuna pruriens* (L.) DC.	*Fabaceae*	-	-	✓
Pungam	*Pongamia pinnata* (L.) Pierre	*Fabaceae*	-	✓	-
Semmaram	*Pterocarpus santalinus* L.	*Fabaceae*	✓	-	-
Thattapayar	*Vigna unguiculata* (L.) Walp.*ssp cylindrical* (L.) Verdc.	*Fabaceae*	✓	-	-
Verkadalai	*Arachis hypogea* L.	*Fabaceae*	✓	-	-
Puthina	*Mentha arvensis* L.	*Lamiaceae*	-	✓	✓
Thumbai	*Leucas aspera* (Willd.) Link	*Lamiaceae*	✓	✓	✓
Tulsi	*Ocimum tenuiflorum* L.	*Lamiaceae*	✓	✓	-
Kothankodi	*Cassytha filiformis* L.	*Lauraceae*	✓	-	-
Sothukatrazhai	*Aloe vera* (L.) Burm.f.	*Liliaceae*	✓	✓	✓
Thaneervittan kizhangu	*Asparagus racemosus* Willd.	*Liliaceae*	✓	-	✓
Vengkayam	*Allium cepa* L.	*Liliaceae*	✓	✓	✓
Etti	*Strychnos nux-vomica* L.	*Loganiaceae*	✓	✓	✓

Contd —

Table 1 — Mapping of species deployment in formulations —*Contd*

Vernacular name	Plant Species	Family Name	A	C	H
Maruthani	*Lawsonia inermis* L.	*Lythraceae*	-	-	✓
Paruthi	*Gossypium hirsutum* L.	*Malvaceae*	✓	-	-
Semparuthi	*Hibiscus rosa-sinensis* L.	*Malvaceae*	-	-	✓
Thuthi	*Abutilon indicum* (L.) Sweet	*Malvaceae*	✓	-	✓
Malaivembu	*Melia azadirach* L.	*Meliaceae*	✓	✓	✓
Vembu	*Azadirachta indica* Adr.Juss	*Meliaceae*	✓	✓	✓
Molagaranai	*Stephania japonica* (Thunb.) Miers	*Menispermaceae*	✓	-	✓
Seenthil	*Tinospora cordifolia* (Willd.) Hook. f. & Thomson	*Menispermaceae*	✓	-	-
Chillodai	*Acacia eburnean (*L.f.) Willd.	*Mimosaceae*	✓	-	-
Thottalsinungi	*Mimosa pudica* L.	*Mimosaceae*	-	-	✓
Usila	*Albizia amara* (Roxb.) Boivin	*Mimosaceae*	-	-	✓
Vagai	*Albizia lebbeck* (L.) Benth.	*Mimosaceae*	✓	-	✓
Velam	*Acacia arabica* (Lam.) *Willd.*	*Mimosaceae*	✓	-	✓
Arasu	*Ficus religiosa* L.	*Moraceae*	✓	-	-
Athi	*Ficus racemosa* L.	*Moraceae*	✓	-	✓
Kari pala	*Artocarpus communis* J.R.Froster *&* G. Forster	*Moraceae*	✓	-	-
Pala	*Artocarpus heterophyllus* Lam.	*Moraceae*	✓	-	✓
Palkattanji	*Plecospermum spinosum* Trecul	*Moraceae*	✓	-	-
Murungai	*Moringa oleifera* Lam.	*Moringaceae*	✓	✓	✓
Malai vazhai / vazhai	*Musa paradisiaca* L.	*Musaceae*	✓	✓	-
Naval	*Syzygium cumini* (L.) Skeels	*Myrtaceae*	✓	✓	✓
Pakku	*Areca catechu* L.	*Palmaceae*	✓	-	-
Kodivaeli	*Plumbago zeylanica* L.	*Plumbaginaceae*	✓	-	-
Cholam	*Sorghum bicolor* L.	*Poaceae*	✓	-	-
Cumbu	*Pennisetum typhoides* (Burm.f.) Stapf. & C.E. Hubb.	*Poaceae*	✓	-	-
Elumicham vasana pillu	*Cymbopogon citratus* (DC.) Stapf.	*Poaceae*	-	✓	-
Makka Cholam	*Zea mays* L.	*Poaceae*	✓	✓	-
Nellu	*Oryza sativa* L.	*Poaceae*	✓	-	-
Varagu	*Paspalum scrobiculatum* L.	*Poaceae*	✓	-	-
Kodirose	*Antigonon leptopus* Hook. & Arn.	*Polygonaceae*	-	✓	-
Mathulai	*Punica granatum* L.	*Punicaceae*	✓	-	-
Naluvai	*Canthium dicoccum* (Gaertner) Teijsm. & Binnend.	*Rubiaceae*	✓	-	-
Nuna	*Morinda pubescence* Roxb.	*Rubiaceae*	-	-	✓
Anathalai	*Clausena dentata* (Willd.) Roemer	*Rutaceae*	✓	✓	✓
Elumichai	*Citrus limon* (L.) Burm.f.	*Rutaceae*	✓	-	-
Karuveppilai	*Murraya koenigii (*L.) Sprengel	*Rutaceae*	-	-	✓
Naarthai	*Citrus aurantium* L.	*Rutaceae*	✓	-	-
Vilvam	*Aegle marmelos* (L.) Corr. Serr.	*Rutaceae*	✓	-	✓
Mudakkattan	*Cardiospermum halicacabum* L.	*Sapindaceae*	✓	-	✓
Pachakoralipattai	*Ixora notoniana* Wallich ex	*Rubiaceae*	✓	-	-
Virali	*Dodonaea angustifolia* L.f.	*Sapindaceae*	✓	-	✓
Sapota	*Achras sapota* L.	*Sapotaceae*	✓	-	-
Kandankathiri	*Solanum surattense* Burm.f.	*Solanaceae*	✓	-	✓
Manathakkali	*Solanum americanum* L.	*Solanaceae*	✓	-	✓
Milagai	*Capsicum frutescens* L.	*Solanaceae*	✓	-	-
Oomathai	*Datura metel* L.	*Solanaceae*	-	✓	-
Sundai	*Solanum torvum* Sw.	*Solanaceae*	✓	-	✓
Thuthuvalai	*Solanum trilobatum* L.	*Solanaceae*	✓	-	✓
Gundathadichi	*Grewia tilifolia* Vahl	*Tiliaceae*	✓	-	-
Ayila	*Holoptelea integrifolia* (Roxb.) Palnch.	*Ulmaceae*	-	-	✓
Kumala	*Gmelina arborea* Roxb.	*Verbenaceae*	-	-	✓
Nochi	*Vitex negundo* L.	*Verbenaceae*	✓	✓	✓
Peenarisangu	*Clerodendron inerme* (L.) Gaertner	*Verbenaceae*	✓	✓	✓
Unnichedi	*Lantana camara* L.	*Verbenaceae*	-	✓	-
Pirandai	*Cissus quadrangularis* L.	*Vitaceae*	✓	✓	✓
Manjal	*Curcuma longa* L.	*Zingiberaceae*	✓	-	✓

A-Animal; C-Crop; H-Human; '✓ '- Use; '–'Not in use

Table 2 — Distribution of species deployed in the IK

Management	No of plant species used	Percentage
Animal alone	40	33
Crop alone	07	6
Human alone	15	12
Animal & Crop	07	6
Animal & Human	30	26
Human & Crop	02	2
Animal, Crop and Human	18	15
Total	119	100

Results of further examination of these 65 species for the plant parts contributed to the 66 kinds of IK formulations used for human healthcare. Plant leaf is the most widely used part also in the case of treating human ailments. The 66 formulations under 40 subjects matter used leaves in 37 instances, roots in 11 instances, bark and fruit in 8 and 9 instances each, seed in 6 instances, and bulb in 3 instances. The whole plant is used only in two formulations and they possessed shrub and climber habits. Only leaf is used in 14 formulations, while fruit alone is used in three formulations, seed alone in two formulations, flower alone in two formulations and tuber, rhizome and bark alone in one each formulation.

Conclusion

The study identified 191 cases under 84 various uses covering disease and health management in animals, plants and humans. Section-wise analysis showed there are 92 cases of IK under 31 subject matters pertaining to animals, 31 cases of IK under 13 subject matters pertaining to plants and 68 cases of IK under 40 subject matters pertaining to humans. It is interesting to note that 49% of the cases of IK related to cattle healthcare and only 16% of the IK cases are concerned with management of plant pest, while 35% of the cases of IK dealt with human health management. Pachamalai Hills is rich in medicinal plants and local communities inherited rich traditional knowledge about the flora. However there is decline in the number of elders who practices herbal cure, while the younger generation knows little or nothing about the indigenous knowledge. Under this current situation, awareness creation, involving school children in the training and revitalization of medicinal plants, establishing herbal gardens, preventing exploitation from pharmaceutical companies, and ensuring economic stake in conservation and sustainable utilization of medicinal plants become major tasks in conservation and sustainable utilization of the medicinal plants in the hills. The conservation efforts of tribals in Pachamalai Hills need to be recognized and rewarded suitably. It is hoped that the study will lead to the revitalization of the *in situ* on-farm conservation traditions of local tribal families of this region.

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References

1 Myers N, The biodiversity challenge: Expanded hot-spots analysis, *Environmentalist*, 10 (1990) 243–256.

2 Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GAB & Kent J, Biodiversity hotspots for conservation priorities, *Nature*, 403 (2000) 853–858.

3 Das P, Das SK, Arya HPS, Singh RP, Mishra Ratan A, Bujarbaruah KM, Subba Reddy G, Verma LR, Geetha Rani M, Gupta HS, Satapathy C & Kavia Z, Inventory of Indigenous Technical Knowledge in Agriculture–Document 2, (Indian Council of Agricultural Research, New Delhi), 2003, 228.

4 Farnsworth NR & Soejarto DD, Global Importance of Medicinal Plants, In: *The Conservation of Medicinal Plants*, edited by Akereli O, Heywood V & Synge H, (Cambridge University Press, Cambridge), 1991, 25-52.

5 Warren DM, Indigenous Knowledge Systems and Development: Background Paper for Seminar Series on Sociology and Natural Resource Management, (The World Bank, Washington, DC), 1990.