

Traditional Herbal Medicines for Primary Healthcare among Indigenous People in Tamil Nadu, India

Muniappan Ayyanar*

Department of Botany and Microbiology, AVVM Sri Pushpam College, Poondi – 613503, Thanjavur, Tamil Nadu, India

Abstract

Nature has been a source of medicinal agents for thousands of years, and an impressive number of modern drugs have been isolated from natural sources, many based on their use in traditional medicine. More than hundred publications are available in the literature with ethnomedicinal claims among different tribal communities of Tamil Nadu mainly focuses on plant species used by the tribal people of Tamil Nadu for their primary healthcare needs. Nowadays the farmers in Tamil Nadu are also interested in cultivating medicinal plants such as *Gloriosa superba*, *Coleus amboinicus*, *Senna angustifolia* *Andrographis paniculata*, *Aloe vera*, etc for their significance in trade. This review summarizes the traditional uses of commonly used medicinal plants among the tribal communities in Tamil Nadu, India. Extensive literature survey was undertaken from ethnobotany and related journals and other publications to document the medicinal plants commonly used by the different ethnic people for their primary healthcare. Western and Eastern Ghats are the main resources for the ethnic people who inhabited in the foot hills and deep forests. These forests hold thousands of medicinal plants which are used by the tribal people for primary healthcare needs. The scientific and vernacular names of plants commonly used by them, family, medicinal properties, part of the plant used and ailments treated are presented along with their major chemical constituents. There is still much we can learn from investigating herbals available abundantly in the forests particularly those which are less well known. This type of research must be promoted as a means for developing countries to understand the potential use of their plant resources, as well as a means to better promote basic healthcare.

Keywords: Ethnomedicine; Healthcare; Medicinal plants; Tamil Nadu

Introduction

According to the World Health Organization (WHO), about 65-80% of the world's population in developing countries, due to the poverty and lack of access to modern medicine, depend essentially on plants for their primary healthcare [1]. In recent years, use of ethnobotanical information in medicinal plant research has gained considerable attention in segments of the scientific community [2]. Historically, all medicinal preparations were derived from plants, whether in the simple form of plant parts or in the more complex form of crude extracts, mixtures, etc. The vast majority of people on this planet still rely on their traditional materia medica for their everyday healthcare needs. The primary benefits of using plant derived medicines are that they are relatively safer than synthetic alternatives, offering profound therapeutic benefits and more affordable treatment [3].

The roots of the Indian traditional systems of medicine can be traced back to approximately 5000 BC [4]. During the last few decades there has been an increasing interest in the study of medicinal plants and their traditional use in different parts of India. There are many reports on the use of plants in traditional healing by either tribal people or indigenous communities of India. In India, medicinal plants are widely used by all sections of the population and it has been estimated that over 7500 species of plants are used by several ethnic communities [5]. Even today, tribals and certain local communities in India practice herbal medicine to cure a variety of diseases and disorders [6].

Tamil Nadu: Geographical information

Tamil Nadu has a great tradition of preserving its forest wealth and concern for environment, which has taught us to respect nature and understand the complex inter-relationship between living and non-living things. The ancient Tamil poets have emphasized the importance of dense forests, clean water and fertile soil in providing ecological security to mankind. The forest eco-system of the state consists of a variety of flora and fauna representing remarkable biodiversity essential

for the environmental stability and water conservation thereby creating food security for survival of present and the future generations. The total forest cover of Tamil Nadu is 21482 km² (16.52%) which includes 12,499 km² dense forests (9.61%) and 8,963 km² open forests (6.91%). Dense forests are found in southern Western Ghats (Nilgiris, Anamalais, Palnis and Tirunelveli-Travancore hill complex) and in parts of Eastern Ghats. In Tamil Nadu, the Western Ghats comprise the Nilgiris, Anamalais, Cardamom hills, Palni hills and Tirunelveli hills; the Eastern Ghats comprise Javadi, Shevaroy, Pachamalais and Kolli hills and the eastern coastal plains provide various habitats and niches suitable for a variety of flora and fauna.

Tribal communities in Tamil Nadu

India possesses more than 500 tribal communities and tribal people constitute 8.2% (8.43 crore) of the country's total population. It is estimated that, tribal people of Tamil Nadu occupy 1.05% of the total state population and 0.77% of the total tribal population of the country with 36 types of tribal communities (Adiyan, Aranadan, Eravallan, Irular, Kadar, Kammara, Kanikaran, Kattunayakan, Kochuvelan, Kondakapus, Kondareddis, Koraga, Kota, Kudiya, Melakudi, Kudiya, Melakudi, Kurichchan, Kurumbas, Mahamalar, Malaiarayan, Malaipandaram, Malaivedan, Malakkuravan, Malasar, Malayali, Malayekandi, Mannan, Mudugar, Muthuvan, Paliyar, Paniyan, Sholaga, Toda and Uraly).

*Corresponding author: Muniappan Ayyanar, Assistant Professor, Department of Botany and Microbiology, AVVM Sri Pushpam College, Poondi – 613503, Thanjavur, Tamil Nadu, India, Tel: +91 99403 76005; E-mail: asmayyanar@yahoo.com

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Nearly a hundred papers have been published and several unpublished reports are also available with ethnomedicinal claims among different tribal communities of Tamil Nadu. Rajan et al. [7], Hosagoudar and Henry [8], Subramanian et al. [9], Rajendran and Henry [10], Arinathan et al. [11], Muthukumarasamy et al. [12], Rajendran et al. [13], Nagendra Prasad et al. [14], Viswanathan et al. [15] Ayyanar and Ignacimugthu [16-25] have done some important ethnobotanical studies among the various tribal communities in Tamil Nadu. The present review mainly focuses on plant species used by the tribal people of Tamil Nadu for their primary healthcare needs.

Methodology

Ethnomedicinal uses of the commonly used plants were elucidated with the previously published literature from the ethnobotanical surveys among different tribal communities in Tamil Nadu. The periodicals searched for the collection of ethnomedicinal information in the ethno/economic botany relevant journals like Ethnobotany, Journal of Economic and Taxonomic Botany, Indian Journal of Traditional Knowledge, Journal of Ethnobiology and Ethnomedicine, Journal of Herbs, Spices and Medicinal Plants, Current Science, Pharmaceutical Biology, Journal of Ethnopharmacology, Phytotherapy Research, and some unpublished reports, etc. Medicinal properties and major chemical constituents of each plant were extracted from the literature of Nadkarni [26], Rastogi and Mehrotra [27], Khare [28], Ayyanar and Ignacimugthu [16-25].

Results and Discussion

The list of plants provided in Table 1 gives the botanical name with authentication, family, common name, local name (Tamil), medicinal properties and major phytochemical constituents of the plants frequently used by the tribal people of Tamil Nadu for their primary healthcare. In addition, the table provides the diseases cured with these plants and the part of the plant used to treat diseases with appropriate references. Most of the tribal people have a general knowledge of medicinal plants for their primary healthcare needs. The common medicinal plants used by them for first aid remedies to treat cough, cold, fever, headache, poisonous bites, wounds, dental problems, hair growth, stomach problems, to strengthen the body and skin diseases [16-25]. Especially the indigenous people, who are residing in the deep forest areas, are still dependent on medicinal plants for their primary healthcare. Many plant remedies are known by some local people, especially by the elder who is not necessarily a traditional healer.

Healers in Tamil Nadu commonly begin their training as children or teenagers working as assistants to their mothers, fathers and to other relatives who are recognized healers. After having trained for a number of years, the apprentice will be ceremonially granted the authority to use a given treatment. This individual will be recognized by others in their culture as having mystical power to heal, as well as having the power to train others in the use of medicinal plants. Most of the tribals have a general knowledge of medicinal plants that are used for first aid remedies, to treat cough, cold, fever, headache, poisonous bites and some other simple ailments [18].

Of the reported plants *Aloe vera*, *Allium cepa*, *Azadirachta indica*, *Cassia auriculata*, *Coccinia indica*, *Ficus bengalensis*, *Gymnema sylvestre*, *Hibiscus rosa-sinensis*, *Mangifera indica*, *Murraya koenigii*, *Phyllanthus amarus* and *Syzygium cumini* have proved as potential anti-diabetic plants [29] in traditional medicine as well as by clinical studies. Costa-Lotufo et al. [30] reported that the plants such as *Phyllanthus emblica*, *Hemidesmus indicus* and *Moringa oleifera* are a source of anticancer compounds. *Bambusa arundinacea* is one of the

significant anti-inflammatory and antiulcer agent [31] and it possesses antihypersensitivity, immunosuppressive, wound healing and antibacterial activity. The plants such as *Abutilon indicum*, *Hemidesmus indicus* and *Vitex negundo* [32], *Acalypha indica*, *Achyranthes aspera*, *Cassia auriculata* and *Centella asiatica* [33,34] are reported as potential antimicrobial agents.

Leaf gel prepared from the leaf of *Aloe vera* is reported to inhibit the growth of 17 types of microorganisms and it is also a potential antibacterial and antifungal agent [35]. Plants such as *Acalypha indica*, *Achyranthes aspera*, *Azadirachta indica*, *Centella asiatica*, *Hibiscus rosa-sinensis*, *Piper betle*, *Syzygium cumini* and *Terminalia chebula* are reported as natural contraceptive agents [36]. *Abutilon indicum*, *Aloe vera*, *Clitoria ternatea*, *Euphorbia hirta*, *Lawsonia inermis*, *Phyllanthus amarus* and *Vitex negundo* are reported for the presence of potential central analgesic properties [37]. *Tinospora cordifolia*, *Ocimum sanctum*, *Azadirachta indica*, *Calotropis procera*, *Withania somnifera*, *Curcuma longa*, *Commiphora mukul*, *Piper longum*, *Andrographis paniculata*, *Peganum harmala*, *Vernonia cinerea* and *Boswellia serrata* are mentioned in ancient texts of Ayurveda as agents of natural sources in the vascular endothelial growth factor mediated pathological angiogenesis [38].

Azadirachta indica, *Centella asiatica*, *Hemidesmus indicus* and *Phyllanthus emblica* are clinically reported as antiulcer agents [39]. *Centella asiatica* and *Clitoria ternatea* are used in traditional medicine for a long period to improve memory and cognitive function [40]. In Nigeria the plants such as *Achyranthes aspera* and *Euphorbia hirta* are used to treat mental disorders [41]. Dafni et al. [42] revealed that, this plant has been used in the treatment of a number of ailments such as inflammation, liver problems, blood purification, lung problems, skin diseases, stomach problems etc. Of the 46 plant species reported by Kani tribals in Tamil Nadu for wound healing, *Acalypha indica*, *Anacardium occidentale*, *Areca catechu*, *Calotropis gigantea*, *Cissampelos pareira*, *Cleome viscosa*, *Eupatorium odoratum*, *Euphorbia hirta*, *Ficus racemosa*, *Ixora coccinea*, *Morinda pubescens*, *Opuntia dillenii*, *Pongamia pinnata*, *Scoparia dulcis* and *Vitex altissima* were investigated experimentally by various researchers in wounded animals [21].

Research in bioactive products is still in early stages in many countries. There is much information on the chemical constituents of medicinal plants in the literature, where structural determination has been an end in itself and the activity of compounds isolated have not been assessed [43]. In the last 2000 years of the history of medicine, we can see that for most of this period, mankind had no other source of medicine than plants, either fresh or dried. Several diverse lines of evidence indicate that medicinal plants represent the oldest and most widespread form of medication. Traditional medical knowledge is important not only for its potential contribution to drug development and market values, but also for the people's healthcare [44]. The world market for plant derived chemicals, pharmaceuticals, fragrances, flavours, and colour ingredients, alone exceeds several billion dollars per year. Classic examples of phytochemicals in biology and medicine include taxol, vincristine, vinblastine, colchicines as well as the Chinese antimalarial, artemisinin and the Indian ayurvedic drug, forskolin [45].

There are hundreds of significant drugs and biologically active compounds developed from the traditional medicinal plants, a few of which are mentioned here; the antispasmodic agent vasicin from *Adhatoda vasica*, anticancer agents such as vincristine, vinblastine and D- Tubocurarine from *Catharanthus roseus* [46], anticancer agents from *Andrographis paniculata*, *Phyllanthus amarus*, *Piper longum*, *Semecarpus anacardium*, *Withania somnifera*, *Moringa oleifera*, *Aloe*

Botanical Name and Family	Common Name	Local Name	Medicinal Properties*	Parts used and Diseases treated	Major phytochemical constituents*
<i>Abutilon indicum</i> G. Don. (Malvaceae)	Country Mallow	Thutthi	Diuretic, astringent, demulcent, expectorant, laxative, aphrodisiac, pulmonary and sedative	Leaf - jaundice [51], piles [52,53], wounds [54], piles and skin diseases [55], venereal diseases [23]	Tannins, alkaloids, asparagines, gallic acid, sesquiterpenes, leucoanthocyanins, flavonoids, sterols, triterpenoids, saponins and cardiac glycosides
<i>Acalypha indica</i> L. (Euphorbiaceae)		Kuppaimeni	Expectorant, anthelmintic, emetic, hypnotic, anodyne and cathartic	Stem - wounds [56]; Leaf - joint pain [57], scorpion bite [58], scabies [11], skin diseases [22,59,60], wounds [21,23], asthma and cough [61]	Alkaloids acalypus and acalyphine, cyanogenetic glucoside and triacetanamine
<i>Achyranthes aspera</i> L. (Amaranthaceae)	Rough chaff tree	Naayuruvi	Alternative, antiperiodic, astringent, diuretic and purgative	Root - muscle pain [8], eye pain [15], toothache [61]; Whole plant - scorpion bite [58], leprosy [13]; Leaf - Piles [62], wounds [60] and toothache [23]	Achyranthine, betaine, cdysterone, oleanolic acid, saponins, tannins and glycosides
<i>Adhatoda vasica</i> Medicus (Acanthaceae)	Malabar Nut, Vasaka	Adathodai	Alternative, antispasmodic, diuretic, expectorant and febrifuge	Whole plant - venereal diseases [63]; Leaf - poison bite and headache [34], cold and cough [54,55], asthma and cold [23,64]	Vasicine, Vasicinone, adhatodic acid and 1-pegamine,
<i>Allium cepa</i> L. (Apiaceae)	Onion	Chinna vengayam	Antiseptic, aphrodisiac, diuretic, demulcent, emmanogogue, expectorant, rubefacient and stimulant	Bulb - wounds [65,66], fever and coolant [67], rheumatism and headache [25,60], cold [15] and rheumatism [68]	Acrid volatile oil, albuminoids, soluble carbohydrates and sugar, catechol and protocatechuic acids
<i>Aloe vera</i> (L.) Burm. f. (Liliaceae)	Barbados Aloe	Soththu katthalai	Anthelmintic, antiseptic, cathartic, emmanogogue, purgative, refrigerant, stomachic and tonic	Leaf - swellings [69,70], wounds [71], fever and eye diseases [72], body cooling [60] and ulcer [73]	Aloin, isobarbaloin, emodin, gum, resin, chrysophanic acid, urinic acid, oxidase, catalase and sugars
<i>Alternanthera sessilis</i> (L.) R.Br. ex. DC. (Amaranthaceae)	Dwarf copperleaf	Ponnankanni keerai	Cholagogue, galactogogue and febrifuge	Leaf - hair tonic [34], nutrient [74] and eye diseases [25,73]	α - and β -tocopherols, stigmasterol and β -sitosterol
<i>Anacardium occidentale</i> L. (Anacardiaceae)	Cashew Nut	Munthiri	Alternative, astringent, demulcent, purgative, rubefacient, fungicidal, vermicial, protozoicidal	Stem bark - fever [75]; Fruit - cholera [15], wounds [21]; asthma and headache [23]; Seed oil - heel cracks [60]	Quercetin, kaempferol, anacardic acid, anacardol, cardol, ginkgo and anacardein
<i>Azadirachta indica</i> A. Juss. (Meliaceae)	Neem	Vembu	Astringent, antiperiodic, antiseptic, anthelmintic, discutient, demulcent, tonic emmanogogue, emollient, insecticide, purgative, refrigerant, stimulant, stomachic and vermifuge	Stem bark - toothache [75], rheumatism [23,60]; Seed oil - headache [34], contraceptive [71]; Leaf - chicken pox [57], antiseptic and wounds [59] and dandruff [76]	Margosine, margosic acid, margosopicrin, glycerides of fatty acids, butyric acid, valeric acid, nimbin, nimbidin, nimbinin, nimbisterin and bakayanin
<i>Bambusa arundinacea</i> (Retz.) Willd. (Poaceae)	Bamboo	Moongil	Anthelmintic, antispasmodic, aphrodisiac, astringent, refrigerant, febrifuge, stimulant and tonic	Leaf - bone setting [60], rheumatism [70]; Seed - rheumatism [23]; Young shoot - food [77]	Silicic acid, cholin, betain, nuclease, urease, cyanogenetic glucoside, benzoic acid and cyanogenetic glucoside
<i>Cardiospermum halicacabum</i> L. (Sapindaceae)	Ballon Vine, Winter Cherry	Mudakkathan	Alternative, diaphoretic, diuretic, emetic, emmenagogue, laxative, rubefacient and stomachic	Leaf - waist pain [8,23], joint pain [23,55]; Stem - rheumatism [57,65,68] and jaundice [74]	β -sitosterol, xalic acid and quebrachitol
<i>Cassia auriculata</i> L. (Caesalpinaceae)	Tanner's Cassia	Avaram poo	Alternative, anthelmintic, attenuant, astringent, refrigerant and tonic	Leaf - eye and skin infections [14,23]; Seeds - piles [78]; Flower - wounds [57], diabetes [73], kidney problems [55] and stomachache [23]	Nonacosane, nonacosan-6-one, chrysophanol, emodin and rubiadin
<i>Centella asiatica</i> (L.) Urban. (Apiaceae)	Indian Pennywort	Vallarai	Adaptogen, central nervous system relaxant, peripheral vasodilator, sedative, diuretic, antibiotic, detoxifier, blood-purifier, laxative and emmenagogue	Whole plant - Jaundice, fever, leprosy [79]; Leaf - Dysentery [79], inflammation [54], jaundice [64], headache [25] and memory power [23]	Vallarine, asiaticoside and oxy-asiaticoside, essential oil, fatty oil, sitosterol, tannin, pectic acid, ascorbic acid, alkaline hydrocotyline and resins
<i>Cissus quadrangularis</i> L. (Vitaceae)	Veld Grape	Pirandai	Alternative, digestive and stomachic	Stem - stomachache [71], rheumatism [70]; Leaf - stomachache [69,73]; Leaf - indigestion and constipation [55]	Ketosteroids, sitosterol, alphaamyrin, α -ampyrone and tetracyclic triterpenoids
<i>Clitoria ternatea</i> L. (Fabaceae)	Butterfly Pea, Winged leaf Clitoria	Sangu pushpam	Cathartic, demulcent, diuretic, laxative and purgative	Root - stomachache [71], wounds [54]; Seed - indigestion [69]; Leaf - diabetes [72] and throat pain [23]	Cinnamic acid, flavonol glycoside and kaempferol

<i>Euphorbia hirta</i> L. (Euphorbiaceae)	Australian Asthma Weed	Amman pachharisi	Anthelmintic, antiasthmatic, antispasmodic, demulcent, antiparasitic, vermifuge, sedative, anxiolytic, analgesic and antipyretic	Whole plant – stomachache [60]; Latex – wounds [21]; Leaf – wounds [22]	Anthocyanins, l-inositol, xanthorhamnin, caoutchouc, resin, tannins albuminoids, gallic acid, quercitin, shikimic acid and choline
<i>Ficus bengalensis</i> L. (Moraceae)	Banyan tree	Aalamaram	Astringent, refrigerant, diuretic and tonic	Stem bark – diabetes [72]; Leaf - diabetes [80]; Latex – rheumatism [68], wounds [25]; Young stem – dental and gum disorders [81] and toothache [23]	Bengalenside, leucocyanidin, Leucopelargonidin and phyosterolin
<i>Gymnema sylvestre</i> (L.) R. Br. (Asclepiadaceae)	Gymnema	Sirukurinchan	Astringent, diuretic, emetic, antiperiodic, refrigerant, stomachic and tonic	Leaf - diabetes [23,57,60,64,65,73], asthma [13] and poison bites [23]	Gymnemic acid, resins, tannins, pararapin, glucose, inositol, anthraquinone, carbohydrates, tartaric acid, calcium salts and crystalline concretions
<i>Hemidesmus indicus</i> R. Br. (Asclepiadaceae)	Indian Sarsaparilla	Nannaari	Antisyphilitic, alterative, antileucorrhoeic, galactogenic, antiarrhoeal, antirheumatic, febrifuge, demulcent, diaphoretic, diuretic, sudorific and tonic	Whole plant – fever and stomachache [64]; Root – mouth ulcer [82], semen production [18], body cooling and rheumatism [70]	Coumarin, volatile oil, hemidesmine, smilasperic, essentialoil, hemidine, hemidescine, emidine, indicine, lupanone, lupeol acetate, sitosterol, hexadecanoic acid and hydroxy-methoxybenzaldehydes.
<i>Hibiscus rosa-sinensis</i> L. (Malvaceae)	Shoe-Flower	Chembarutthi	Anodyne, aphrodisiac, demulcent, emollient, emmanagogue and refrigerant	Flower - jaundice [83], blood secretion [73], menstrual disorders [54] and heart problems [23,73]	Cyclopropanoids, methyl sterulate, methyl-2-hydroxysterulate, 2-hydroxysterulate, Malvalate, β -sitosterol, cyanidin 3-sophoroside, aspartic acid and asparagin.
<i>Mangifera indica</i> L. (Anacardiaceae)	Mango	Maamaram	Anthelmintic, antiscorbutic, astringent, diaphoretic, diuretic, laxative, refrigerant, stomachic and tonic	Stem bark - bleeding [67], asthma [80]; Fruit - mouth ulcer [81]; Leaf – toothache [73]; Seed – cholera [68] and delivery pain [23,25]	Tartaric, citric, gallic and malic acids, tannins, β -carotene, kaempferol, myricetin, α and β -amyryns, gallotannin, glucogallin, indicol, taraxerol, friedelin, lupeol and β -sitosterol
<i>Murraya koenigii</i> (L.) Spreng. (Rutaceae)	Curry leaf	Karuveppilai	Purgative, stomachic and tonic	Root - toothache [8]; Bark - toothache [75]; Leaf – To arrest vomiting [84], eye problems and indigestion [23,55], stomachache [61] and chicken-pox [73]	Koenigin, β - carotene, coumarin glucoside and scopolin
<i>Ocimum sanctum</i> L. (Lamiaceae)	Holy Basil	thulasi	Aromatic, anti-cattarrhal, antiperiodic, demulcent, expectorant, febrifuge and stomachic	Leaf - cold, cough and fever [8,61], fits [57], scorpion sting [60,85]; Whole plant - cold, cough and fever [16,23]	Eugenol, carvacrol, nerol, eugenolmethylether, ursolic acid, apigenin, luteolin, orientin, molludistin and ursolic acid
<i>Phyllanthus amarus</i> Schum and Thonn. (Euphorbiaceae)	Stone breaker, Seed under leaf	Keelanelli	Astringent, refrigerant, deobstruent, diuretic and stomachic	Whole plant - jaundice [61]; Root - jaundice [69]; Leaf - jaundice [23,57,60,74,86]	Phyllanthin, hypophyllanthin, niranthin, nirtetralin, phyltetralin, quercetin, quercitrin, astragaln, rutin, kaempferol and amarulone
<i>Phyllanthus emblica</i> L. (Euphorbiaceae)	Indian Gooseberry	Periya nelli	Astringent, carminative, diuretic, laxative, refrigerant and stomachic	Leaf - cold [65]; Fruit - jaundice [83], Asthma [85], inflammation [80], blood pressure [73] and body strength [23]	Phyllembin, gallic, ascorbic acid and proanthocyanidin
<i>Piper betle</i> L. (Piperaceae)	Betel pepper	Vetrilai	Antiseptic, aromatic, aphrodisiac, astringent, digestive, stomachic, stimulant and carminative	Leaf – to prevent thirst [60], gum bleeding [81], skin diseases [76], ear pain [68], skin diseases [23] and scorpion bite [58]	β - and gamma-sitosterol, hentriacontane, pentatriacontane, <i>n</i> -triacontanol, stearic acid, chavicol, carvacrol, eugenol, allyl catechol, cineole, estragol, caryophyllene, cardinene, <i>p</i> -cymene and eugenol methyl ether.
<i>Piper nigrum</i> L. (Piperaceae)	Black Pepper	Milagu	Antiperiodic, antipyretic, carminative, resolvent, rubefacient and rubefacient	Leaf and fruit - stomach problems [8], wounds and skin diseases [59]; Seed - throat infection [64]; Leaf – rheumatism [70]; Fruit – dysentery [13], skin diseases [76], cough and snakebite [23]	Piperine, piperidine, piperitine, balsamic and chavicin
<i>Pongamia pinnata</i> Pierre. (Papilionaceae)	Pongam Oil tree, Indian Beech	Pugamaram	Antiseptic, antiparasitic, astringent, cholagogue, febrifuge, expectorant, stimulant and tonic	Seed oil – skin diseases [80], wounds [21,23]; Flower – diabetes [68]; Root – Ulcer [72]; Seeds – rheumatism [77]	Pongamol (Pogamia oil), karanjin, glabrin, alkaloid, resin, mucilage, sugar, acetyl, benzoyl derivatives, myristic, palmitic, stearic, arachidic, lignoceric, dihydroxy stearic, lino lenic, linolic and oleic acids
<i>Solanum nigrum</i> L. (Solanaceae)	Black Nightshade	Manathakkali	Alternative, anodyne, diuretic, diaphoretic, expectorant and sedative	Leaf - wounds, stomachache and fertility problems [8,61,64,65]; ulcer [25,55]; Whole plant - fever [13]	Solasonine, α -and β -solanigrine, α -and β -solamargine; steroidal sapogenins, diosgenin, tigogenin, solasodine and solasodine
<i>Solanum xanthocarpum</i> S. and W. (Solanaceae)	Yellow Berried Nightshade	Kandan-katthiri	Alternative, astringent, carminative, diuretic, expectorant, febrifuge and laxative	Stem - cough [34]; Leaf - cough [55,69]; skin diseases [61]; Seed - toothache [23,56,64]; Stem and leaf - ulcer [54]	solasonine, solamargine, beta-solamargine and Solasodine, apigenin, quercetin diglycoside, sitosterol and diosgenin
<i>Syzygium cumini</i> (L.) Skeels. (Myrtaceae)	Jambolan, Black Plum	Naaval	Astringent, carminative, diuretic and stomachic	Stem bark - toothache [8,61]; dysentery [80], Seed - diabetes [23,58,61]; Leaf - dysentery [85]	Bergenin, gallic acid, ethyl gallate, anthocyanins, citric, malic, ellagic and gallic acids, β -sitosterol, kaempferol, quercetin, friedelin and betulinic acids

Terminalia chebula Retz. (Combretaceae)	Chebolic Myrobalan	Kadukkai	Alternative, antibilious, astringent, purgative, laxative, stomachic and tonic	Flower - asthma [62] Fruit - Indigestion [65], asthma [62], stomachache [64], bone fracture [82] and ulcer [23,80]	Shikimic, gallic, triacontanoic and palmitic acids, β -sitosterol, daucosterol, chebolic acid, ellagitannin, terchebulin, punicalagin, teaflavin A, chebupentol, arjungenin, terminoic and arjunolic acid
Vitex negundo L. (Verbenaceae)	Five-Leaved Chaste Tree	Notchi	Alternative, antiparasitic, aromatic, astringent, discutient, emmenagogue, expectorant, febrifuge, tonic and vermifuge	Leaf - asthma and headache [86], cold [55,69], poison bites [23], wounds [61]; Stem - cough [86] and Fever [58]	Essential oil, organic, malic acid, alkaloids and resin, iridoids, lignan, ecdysones, iridoid glucoside, Acetyl oleanolic acid, sitosterol, isomeric flavanones and furanoeremophilane

*Nadkarni [26]; Rastogi and Mehrotra [27]; Khare [28]; Ayyanar and Ignacimuthu [19,20,24]

Table 1: Common medicinal plants used by the tribal people of Tamil Nadu, India.

vera, *Curcuma longa*, *Allium sativum* and *Tinospora cordifolia* [47], promising and potent antimalarial drug artemisinin from *Artemisia annua* [48].

Research on medicinal plants and the search for plant-derived drugs require a multidisciplinary approach with integrated projects, financial and technical support, and a very carefully planned strategy. The aims should consider demands in terms of public health, preservation of biodiversity and the technical qualification of each laboratory or research group involved [49]. Renewed interest in traditional pharmacopoeias has meant that researchers are concerned not only with determining the scientific rationale for the plant's usage, but also with the discovery of novel compounds of pharmaceutical value [50].

In Tamil Nadu also there is a growing interest among the local people and farmers in cultivating medicinal plants which are in high medicinal value and significance in trade. The efficacy and safety of the commonly used ethnomedicinal plants needs to be evaluated for detailed phytochemical and pharmacological studies especially the plants with high trade value should be given priority to carry out bioassay and toxicity studies. Ayyanar and Ignacimuthu [23] reported that the frequently used medicinal plants such as *Alpinia galanga*, *Azadirachta indica*, *Calophyllum inophyllum*, *Gymnema sylvestre*, *Leucas apsera*, *Melia azedarach*, *Mollugo nudicaulis*, *Ocimum tenuiflorum*, *Syzygium cumini*, *Terminalia chebula* and *Tribulus terrestris* by the Kani tribal people in Tamil Nadu should be further analyzed for the associated pharmacological studies.

Conclusion

This review revealed that plants have formed the basis of sophisticated traditional medicine systems that have been in existence for thousands of years and continue to provide mankind with new remedies. Medicinal plant therapy is based on the empirical findings of hundreds and thousands of years. Some plants with higher performance indices were found to be widely used in other regions of India for the treatment of variety of ailments. There are also other plants in the literature known for their effective properties against certain ailments, which leads credibility to the popular pharmacopoeia used by the tribal people. They have a rich ethnobotanical knowledge, but this is fading due to migration to urban areas, a loss of interest among the young, religious restrictions or dependence on modern medicine. The wealth of tribal knowledge of medicinal and other useful plants points to a great potential for research and the discovery of new drugs to fight diseases.

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References

1. Calixto JB (2005) Twenty-five years of research on medicinal plants in Latin America: a personal view. J Ethnopharmacol 100: 131-134.
2. Heinrich M (2000) Ethnobotany and its role in drug development. Phytother Res 14: 479-488.
3. Iwu MW, Duncan AR, Okunji CO (1999) New antimicrobials of plant origin. In: J. Janick (Ed), Perspectives on new crops and new uses. ASHS Press, Alexandria.
4. Sharma AK, Sharma AK (2013) A Critical Appraisal of Headache vis-à-vis Shiro Roga. J Homeop Ayurv Med 2: 1-3.
5. Anthropological survey of India (1994) People of India Project Report.
6. Mahishi P, Srinivasa BH, Shivanna MB (2005) Medicinal plant wealth of local communities in some villages in Shimoga District of Karnataka, India. J Ethnopharmacol 98: 307-312.
7. Rajan S, Sethuraman M, Mukherjee PK (2002) Ethnobiology of the Nilgiri hills, India. Phytother Res 16: 98-116.
8. Hosagoudar VB, Henry AN (1996) Ethnobotany of Kadars, Malasars and Muthuvans of the Anamalais in Coimbatore district, Tamil Nadu, India. J Econ Taxon Bot 12: 260-267.
9. Subramanian A, Mohan VR, Kumaresan S, Chelladurai V (2003) Medicinal plants used by the Valaiyans of Madurai district, Tamil Nadu. J Econ Taxon Bot 27: 785-787.
10. Rajendran A, Henry AN (1994) Plants used by the tribe Kadar in Anamalai hills of Tamil Nadu. Ethnobotany 6: 19-24.
11. Arinathan V, MohanVR, John de Britto A, Chelladurai V (2003) Studies on food and medicinal plants of Western Ghats. J Econ Taxon Bot 27: 750-753.
12. Muthukumarasamy S, Mohan VR, Kumaresan S, Chelladurai V (2003) Herbal remedies of Paliyar tribe of Grizzled Giant Squirrel Wildlife Sanctuary, Western Ghats, Srivilliputhur, Tamil Nadu for poisonous bites. J Econ Taxon Bot 27: 761-764.
13. Rajendran SM, Agarwal SC, Sundaresan V (2004) Lesser Known Ethnomedicinal Plants of the Ayyarkarkoil Forest Province of Southwestern Ghats, Tamil Nadu, India-Part I. J Herbs, Spices Med Plants 10: 103-112.
14. Nagendra Prasad P, Jabadhas AW, Janaki Ammal EK (1987) Medicinal plants used by the Kanikkars of south India. J Econ Taxon Bot 11: 149-155.
15. Viswanathan MB, Premkumar EH, Ramesh N (2001) Ethnomedicines of Kanis in Kalakad Mundanthurai Tiger Reserve, Tamil Nadu. Ethnobotany 13: 60-66.
16. Ayyanar M, Ignacimuthu S (2005) Traditional knowledge of Kani tribals in Kouthalai of Tirunelveli hills, Tamil Nadu, India. J Ethnopharmacol 102: 246-255.
17. Ayyanar M, Ignacimuthu S (2005) Ethnomedicinal plants used by the tribals of Tirunelveli hills to treat poisonous bites and skin diseases. Indian J Tradit Know 4: 229-236.
18. Ayyanar M (2008) Ethnobotanical Wealth of Kani tribe in Tirunelveli hills. Ph.D Thesis. University of Madras, Chennai, India.
19. Ayyanar M, Ignacimuthu S (2008) Pharmacological actions of *Cassia auriculata* L. and *Cissus quadrangularis* Wall: a short review. J Pharmacol Toxicol 3: 213-221.
20. Ayyanar M, Ignacimuthu S (2008) Medicinal uses and Pharmacological actions of five commonly used Indian medicinal plants: a mini-review. Iran J Pharm&Ther 8: 107-114.
21. Ayyanar M, Ignacimuthu S (2009) Herbal medicines for wound healing among

- tribal people in Southern India: Ethnobotanical and Scientific evidences. *Int J Appl Res Nat Prod* 2: 29-42.
22. Ayyanar M, Ignacimuthu S (2010) Diversity, Conservation status and Medicinal plants of the family Euphorbiaceae in Agasthiyamalai hills of Tamil Nadu (Tirunelveli hills). *J Exp Sci* 1: 12-16.
23. Ayyanar M, Ignacimuthu S (2011) Ethnobotanical survey of medicinal plants commonly used by Kani tribals in Tirunelveli hills of Western Ghats, India. *J Ethnopharmacol* 134: 851-864.
24. Ayyanar M, Ignacimuthu S (2011) Role of traditional medicinal plants in drug discovery: Ethnobotanical approaches. *Herbal Perspectives: Present & Future*, Satish Serial Publishing House, Delhi, India.
25. Ayyanar M, Ignacimuthu S (2013) Plants as food and medicine: an Ethnobotanical survey among Kanikaran community in southern India. *Eur J Nutr Food Safety* 3: 123-133.
26. Nadkarni AK (1976) *Indian Materia Medica*, Popular Prakashan, Bombay, India.
27. Rastogi RP, Mehrotra BN (1990-1994) *Compendium of Indian Medicinal Plants*. Central Drug Research Institute, Lucknow and National Institute of Science Communication (1-4), New Delhi, India.
28. Khare CP (2007) *Indian Medicinal Plants: An illustrated dictionary*, Springer Science + Business Media, New York, USA.
29. Mukherjee PK, Maiti K, Mukherjee K, Houghton PJ (2006) Leads from Indian medicinal plants with hypoglycemic potentials. *J Ethnopharmacol* 106: 1-28.
30. Costa-Lotufo LV, Khan MT, Ather A, Wilke DV, Jimenez PC, et al. (2005) Studies of the anticancer potential of plants used in Bangladeshi folk medicine. *J Ethnopharmacol* 99: 21-30.
31. Muniappan M, Sundararaj T (2003) Antiinflammatory and antiulcer activities of *Bambusa arundinacea*. *J Ethnopharmacol* 88: 161-167.
32. Kumar VP, Chauhan NS, Padh H, Rajani M (2006) Search for antibacterial and antifungal agents from selected Indian medicinal plants. *J Ethnopharmacol* 107: 182-188.
33. Perumal Samy R, Ignacimuthu S, Sen A (1998) Screening of 34 Indian medicinal plants for antibacterial properties. *J Ethnopharmacol* 62: 173-182.
34. Samy RP, Ignacimuthu S (2000) Antibacterial activity of some folklore medicinal plants used by tribals in Western Ghats of India. *J Ethnopharmacol* 69: 63-71.
35. Reynolds T, Dweck AC (1999) Aloe vera leaf gel: a review update. *J Ethnopharmacol* 68: 3-37.
36. Unny R, Chauhan AK, Joshi YC, Dobhal MP, Gupta RS (2003) A review on potentiality of medicinal plants as the source of new contraceptive principles. *Phytomedicine* 10: 233-260.
37. Almeida Cde F, de Amorim EL, de Albuquerque UP, Maia MB (2006) Medicinal plants popularly used in the Xingó region - a semi-arid location in Northeastern Brazil. *J Ethnobiol Ethnomed* 2: 15.
38. Arun Kumar M, Nisha Kumari O, Abhimanyu Kumar (2013) Prospective Role of Indian Medicinal Plants in Inhibiting Vascular Endothelial Growth Factor (VEGF) mediated Pathological Angiogenesis. *J Homeop Ayurv Med* 2: 1-5.
39. Dharmani P, Palit G (2006) Exploring Indian medicinal plants for antiulcer activity. *Indian J Pharmacol* 38: 95-99.
40. Howes MJ, Houghton PJ (2003) Plants used in Chinese and Indian traditional medicine for improvement of memory and cognitive function. *Pharmacol Biochem Behav* 75: 513-527.
41. Nwosu MO (1999) Herbs for mental disorders. *Fitoterapia* 70: 58-63.
42. Dafni A, Levy S, Lev E (2005) The ethnobotany of Christ's Thorn Jujube (*Ziziphus spina-christi*) in Israel. *J Ethnobiol Ethnomed* 1: 8.
43. Mulholland DA (2005) The future of ethnopharmacology: a southern African perspective. *J Ethnopharmacol* 100: 124-126.
44. Sheng-Ji P (2001) Ethnobotanical approaches of traditional medicine studies: some experiences from Asia. *Pharm Biol* 39 Suppl 1: 74-79.
45. Hoareau L, Da Silva EA (1999) Medicinal plants: a re-emerging health aid. *Elect J Biotech* 2.
46. Gurib-Fakim A (2006) Medicinal plants: traditions of yesterday and drugs of tomorrow. *Mol Aspects Med* 27: 1-93.
47. Balachandran P, Govindarajan R (2005) Cancer--an ayurvedic perspective. *Pharmacol Res* 51: 19-30.
48. Dhingra V, Vishweshwar Rao K, Lakshmi Narasu M (2000) Current status of artemisinin and its derivatives as antimalarial drugs. *Life Sci* 66: 279-300.
49. Rates SM (2001) Plants as source of drugs. *Toxicol* 39: 603-613.
50. Fennell CW, Lindsey KL, McGaw LJ, Sparg SG, Stafford GI, et al. (2004) Assessing African medicinal plants for efficacy and safety: pharmacological screening and toxicology. *J Ethnopharmacol* 94: 205-217.
51. Ganesan S, Kesavan L (2003) Ethnomedicinal plants used by the ethnic group Valaiyans of Vellimalai hills (Reserved Forest), Tamil Nadu, India. *J Econ Taxon Bot* 27: 754-760.
52. Rosakutty PJ, Stella Roslin A, Ignacimuthu S (2003) Some traditional folklore medicinal plants of Kanyakumari district, Tamil Nadu. *J Econ Taxon Bot* 23: 369-375.
53. Dwarakan P, Ansari AA (1996) Less known uses of plants of Kollimalai (Salem district, Tamil Nadu) in South India. *J Econ Taxon Bot* 12: 284-286.
54. Nagendra Prasad N, Ranjit Singh AJA, Narayanan LM, Natarajan CR (1996) Ethnobotany of Kanikkars of south Tamil Nadu. *J Econ Taxon Bot* 12: 292-298.
55. Jeyaprakash K, Ayyanar M, Geetha KN, Sekar T (2011) Traditional uses of medicinal plants among the tribal people in Theni district (Western Ghats) southern India. *Asian Pac J Trop Biomed* 1: 20-25.
56. Ramachandran VS, Manian S (1989) Ethnobotanical notes on the Irulas, the Koravas and Puliyan of Coimbatore district, Tamil Nadu. *Indian Bot Rep* 8: 85-91.
57. Sandhya B, Thomas S, Isabel W, Shenbagarathai R (2006) Ethnomedicinal plants used by the Valaiyan community of Piranmalai hills (Reserved forest), Tamil Nadu, India-A pilot study. *Afri J Trad Compl Alter Med* 3: 101-114.
58. Udayan PS, Satheesh G, Tushar KV, Balachandran I (2006) Medicinal plants used by the Malayali tribe of Shevaroy hills, Yercaud, Salem district, Tamil Nadu. *Zoo's Print J* 21: 2223-2224.
59. Kiruba S, Jeeva S, Dhass SSM (2006) Enumeration of ethnoveterinary plants of Cape Comorin, Tamil Nadu. *Indian J Trad Know* 5: 576-578.
60. Ignacimuthu S, Ayyanar M, Sankarasivaraman K (2008) Ethnobotanical study of medicinal plants used by Paliyar tribals in Theni district of Tamil Nadu, India. *Fitoterapia* 79: 562-568.
61. Kumari Subitha T, Ayyanar M, Udayakumar M, Sekar T (2011) Ethnomedicinal plants used by Kani tribals in Pechiparai forest of Western Ghats in Kanyakumari Dist, Tamil Nadu, India. *Int Res J Plant Sci* 2: 349-354.
62. Viswanathan MB (1989) Ethnobotany of Malayalis in the Yelagiri hills of Vellore district, Tamil Nadu. *J Econ Taxon Bot* 13: 667-671.
63. Goel AK, Rajendran A (1999) Cross-cultural ethnobotanical studies of Santal Pargana (Eastern India) and Western Ghats (South India). *J Econ Taxon Bot* 23: 147-150.
64. Ignacimuthu S, Ayyanar M, Sivaraman K S (2006) Ethnobotanical investigations among tribes in Madurai District of Tamil Nadu (India). *J Ethnobiol Ethnomed* 2: 25.
65. Ramachandran VS, Nair NC (1981) Ethnobotanical observations on Irulars of Tamil Nadu (India). *J Econ Taxon Bot* 2: 183-190.
66. Sivakumar A, Subramanian MS, Karunakaran M, Burkanudeen A (2003) Ethnobotany of Poliyars of Anaimalai hills, Tamil Nadu. *J Econ Taxon Bot* 27: 679-685.
67. Ganesan S, Venkateshan G, Banumathy N (2006) Medicinal plants used by ethnic group Thottianaickans of Semmalai hills (reserved forest), Tiruchirappalli district, Tamil Nadu. *Indian J Trad Know* 5: 245-252.
68. Udayakumar M, Ayyanar M, Sekar T (2010) Medicinal Plants used by local practitioners in Villupuram district of Tamil Nadu, Southern India. *Med Plants* 2: 145-155.
69. Balasubramanian P (1992) Observations on the utilizations of forest plants by the tribals of Point Calimere Wildlife Sanctuary, Tamil Nadu. *Bull Bot Survey India* 34: 100-111.
70. Sutha S, Mohan VR, Kumaresan S, Murugan C, Athiperumalsami T (2010) Ethnomedicinal plants used by the tribals of Kalakad-Mundanthurai Tiger

- Reserve, Western Ghats, Tamil Nadu for the treatment of rheumatism. Indian J Trad Know 9: 502-509.
71. Lakshmanan KK, Sankaranarayanan AS (1990) Antifertility herbals used by the tribals of Anaikatty hills, Coimbatore district, Tamil Nadu. J Econ Taxon Bot 14: 171-173.
72. Senthilkumar M, Gurumoorthi P, Janardhanan K (2006) Some medicinal plants used by Irular, the tribal people of Marudhamalai hills, Coimbatore, Tamil Nadu. Nat Prod Rad 5: 382-388.
73. Natarajan D, Balaguru B, Nagamurugan N, Soosairaj S, Natarajan E (2010) Ethno-medico-botanical survey in the Maligainathan village, Kandarakottai taluk, Pudukkottai district, Tamil Nadu. Indian J Trad Know 9: 768-774.
74. Balasubramanian P, Narendra Prasad S (1996) Medicinal plants among the Irulars of Attappady and Boluvampatti forests in the Nilgiri Biosphere Reserve. J Econ Taxon Bot 12: 253-259.
75. Rajan S, Baburaj DS, Sethuraman M (2001) Indigenous folk practices among Paniyas of Nilgiri district, Tamil Nadu, India. J Med Arom Plant Sci 23: 602-606.
76. Kingston C, Jeeva S, Jeeva GM, Kiruba S, Mishra BP, et al. (2009) Indigenous knowledge of using medicinal plants in treating skin diseases in Kanyakumari district, Southern India. Indian J Trad Know 8: 196-200.
77. Ragupathy S, Newmaster SG (2009) Valorizing the 'Irulars' traditional knowledge of medicinal plants in the Kodiakkarai Reserve Forest, India. J Ethnobiol Ethnomed 5: 10.
78. Subramaniam A (1999) A survey of medicinal plants from Chitheri hills in Dharmapuri district, Tamil Nadu. J Econ Taxon Bot 23: 395-416.
79. Viswanathan MB (1997) Ethnobotany of Malayalis in Vellore district, Tamil Nadu, India. Ethnobotany 9: 77-79.
80. Kadavul K, Dixit AK (2009) Ethnomedicinal studies of the woody species of Kalrayan and Servarayan Hills, Eastern Ghats, Tamil Nadu. Indian J Trad Know 8: 592-597.
81. Ganesan S (2008) Traditional oral care medicinal plant survey of Tamil Nadu. Nat Prod Rad 7: 166-172.
82. Udayan PS, Tushar KV, George S, Balachandran I (2007) Ethnomedicinal information from Kattunayakas tribe of Mudumalai Wildlife Sanctuary, Nilgiris district, Tamil Nadu. Indian J Trad Know 6: 574-578.
83. Sankaranarayanan AS (1988) Folk-lore medicines for jaundice from Coimbatore and palghat districts of Tamil Nadu and kerala, India. Anc Sci Life 7: 175-179.
84. Muthu C, Ayyanar M, Raja N, Ignacimuthu S (2006) Medicinal plants used by traditional healers in Kancheepuram district of Tamil Nadu, India. J Ethnobiol Ethnomed 2: 43.
85. Mandal SK, Basu SK (1996) Ethnobotanical studies among some tribals of Nilgiri district, Tamil Nadu. J Econ Taxon Bot 12: 268-271.
86. Rajendran SM, Chandrasekar K, Sundaresan V (2001) Ethnomedicinal lore of Seithur hills-Western Ghats, Tamil Nadu. Ethnobotany 13: 101-109.