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Full Length Research Paper

Antibacterial activity of medicinal plants used as ethnomedicine by the traditional healers of Musiri Thaluk, Trichy District, Tamilnadu, India

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The objective of this study was to collect information about medicinal plants and their uses by the knowledge obtained from the traditional healers in Musiri thaluk of Trichy district, Tamilnadu, India. It was also to determine the phytochemical properties and antimicrobial activity of fifteen different plants selected based on spearman rank correlation. The traditional healers of Musiri thaluk, Trichy district used different species of medicinal plants belonging to different families for the treatment of various diseases. Common maximum number of species has been used for fever followed by skin infection, wound healing and antiseptic. Herbs were found to be the most used plants followed by climbers, shrubs and trees. The spearman rank correlation was used to analyse the knowledge about medicinal plants. Antibacterial activity of fifteen medicinal plants (*Acalypha fruticosa, Caralluma attenuate, Cissampelos pareira, Elephantopus scaber, Mukia maderaspatensis, Justicia simplex, Lepidagathis cristata, Rhinacanthus nasutus, Sida acuta, Theprosia purpurea, Toddalia asiatica, Tridax procumbens, Tylophora indica, Trichodesma indicum* and *Oldenlandia umbellata*) was determined by measuring the diameter of zone of inhibition, that is the mean of triplicates + standard deviation (SD) of three replicates. Of these, *T. procumbens* and *T. indica* exhibited more promising bactericidal activity against *Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Proteus mirablis* and *Vibrio cholerae*. The traditional healers in Trichy district possess rich ethno-botanical knowledge. This study on medicinal plants will attract ethano botanist, phytochemistrist and pharmacologists in identifying many high value medicinal plant species for research of novel antibacterial compound of these medicinal plants.

Key words: Antibacterial, medicinal plants, traditional medicine, local healers.

INTRODUCTION

Ethnobotany deals with the potential of plants used by traditional healers. These plants provide new and useful products to the world. Ethno botany is the base for the origin of many plant extracts used in modern medicine.

Traditional healers modify ethno botany practice and combination of plant products to safe guard their knowledge and also to overcome the commercialization of new products from the knowledge of ethno botany

(Chopra et al., 1997). World Health Organization records that medicinal plants are the best source for the production of new herbal drugs. The efficacies of the plant extracts are due to the presence of phytochemicals. Systematic screening of the plant extract and phytochemicals result in the discovery of novel effective compounds (Akinpelu and Onakoya, 2006).

India throughout its long history has accumulated a rich body of empirical knowledge of the use of medicinal plants for the treatment of various diseases. Chemical studies of Indian medicinal plants provide a valuable material base for the discovery and development of new drugs of natural origin. The different plant parts used include root, stem, flower, fruit, twigs, exudates and modified plant organs. While some of these raw drugs are collected in smaller quantities by the local communi-ties and folk healers for local use, many other raw drugs are collected in larger quantities and traded in the market as the raw material for many herbal industries (Heinrich and Gibbons, 2001). Plants have the vast potentiality as sources for antimicrobial drugs (Samuelsson, 2004). Numerous biologically active plants are discovered by evaluation of ethnopharmacological data, and these plants may offer the local population immediately accessible therapeutic products (Newman et al., 2003).

In this present research article, the medicinal value of 15 plants have been reported after collecting authentic information from the users of traditional medicinal plants of Musiri Thaluk, Trichy district of Tamil Nadu, India. An effort has been to expand the spectrum of antimicrobial agents from those natural resources that is, 15 medicinal plants belonging to eleven families. They have been selected based on their traditional uses especially antiseptic, skin diseases and wound healing activity. To the best of our knowledge, no positive report is available on the antibacterial activity of methanol extracts of some of these plants.

MATERIALS AND METHODS

Study area

Tiruchirappalli district is located at the Central part of Tamil Nadu surrounded by Perambalur district in the north, Pudukkotai district in the south, Karur and Dindigul districts in the west and Thanjavur district in the east. It lies between 10° 10’ and 11° 20’ of the Northern latitudes and 78° 10’and 79°0' of Eastern latitudes in the centre part of the Tamil Nadu. The general slope of the district is towards east. It has a number of detached hills, among which Pachamalai Hill is an important one, which has a peak up to 1015 m, located at Sengattupatti Rain Forest.

Survey

In order to assess the consumption of indigenous medicinal plants, survey was carried out during the year, 2009 in the forest areas of Trichy district in Tamilnadu, India. To get maximum information, the survey was widened diagonally during the rainy season. The information on medicinal uses of the indigenous plants has been described after gathering it from local people, experienced aged rural folk, traditional herbal medicine practitioners, local herbal drug sellers and the information collected from the available literature. A total of 275 residents were interviewed. Randomly, people were selected, out of which 160 men and 115 women of age 25 and above (x = 57.92) were interviewed in their local language, that is, Tamil. In addition, direct plant observation and identification was done with the help of local healers known as ‘Maruthuvar’. A structured feedback form was used to draw information from the resource persons using standard methods (Martin, 1995). Infor-mation on medicinal plants, local name, plant parts used and mode of administration for curing diseases has been recorded. Plants col-lected during the surveys were identified with the help of published regional flora (Gamble, 1935; Matthew, 1983). The identified plant specimens were then confirmed by Dr. Sankaranarayanan, Assistant Director, Department of Research and Development, Sri Sairam Sidha medical College & Research Centre, West Tambaram, Chennai-44, Tamilnadu, India. The specimens were deposited in the Herbarium, Department of Medicinal Botany, Sri Sairam Sidha medical College & Research Centre, West Tambaram, Chennai-44. Voucher specimen numbers along with other details are given in Table 1.

Views of local people

Information obtained from medicinally important plants was assessed by calculating the proportion of plants cited and their utilization in relation to the total number of interviewees.

Categorization of medicinally important plants

Traditionally important medicinal plants which were cultivated, as well as grown in the wild were classified into different types of habits and forms such as trees, herbs, shrubs, climbers, etc.

Biodiversity of medicinally important plant species

Medicinally important plant species were found to be in abundance in each sampling unit when surveyed. Depending upon the number, they were then divided into four arbitrary groups namely, rare, common, fairly common and abundant.

Knowledge about plants and their uses

The spearman rank correlation was used to analyze the knowledge about medicinal plant and its correlation with age of survey samples ($P < 0.005$).

Bacterial samples

Standard strains: *Staphylococcus aureus* MTCC 29213, *Escherichia coli* MTCC 25922, *Pseudomonas aeruginosa* MTCC 27853, *Proteus mirablis* MTCC 13315, *Vibrio cholerae* MTCC 12657 were used.

Phytochemical analysis of the plant extract

The 70% aqueous methanol extracts were subjected to phytoche-mical tests for presence of plant secondary metabolites like tannins, saponins, flavonoids, alkaloids and glycosides in accordance with Trease and Evans (1989) and Harborne (1998), with little modification.

Table 1. List of ethno medicinal plants and their traditional uses as per data collected from Musiri Thaluk, Trichy district, Tamilnadu,India.

Botanical name and voucher specimen number	Family	Local name/vernacular name	Mode of preparation and ethnomedicinal uses
Acalypha fruticosa Forssk (S2325)	Euphorbiaceae	Sinni	Half spoon Leaves juice is given to children for safe emetic and intestinal worms. Juice from fresh leaves may be employed in scabies and other skin diseases, and with lime and onion it is a good stimulating application in rheumatism
Caralluma attenuate Wt. (S6548)	Asclepiadaceae	Kallumudayan	The fleshy stem is eaten raw as a cure for diabetes used as blood purification and helps to relieve dermatitis, eczema and dandruff
Cissampelos pareira Linn. (S3856)	Menispermaceae	Appatta	Roots on external application have the property of wound healing and antidote; paste of roots is used for fistula, pruritis, skin disorders and snake poison
Elephantopus scaber Linn. (S4796)	Compositae	Aanaikalsuvati	The leaves of the plant are used for conditions like bronchitis, small pox and diarrhea. The whole plant decoction used as diuretic, hepatitis, bronchitis, in cough associated with pneumonia
Justicia simplex D.Don. (S5403)	Acanthaceae	Otivuatakki	The leaves of the plant are externally applied for bone fracture and chronic wound
Lepidagathis cristata Willd (S5653)	Acanthaceae	Karappan poondu	Leaf extract is externally applied for ring worm and other skin diseases. Internally decoction of the leaves used for fever
Mukia maderaspatensis (L.) M.Roem (S8779)	Cucurbitaceae	Musumusukai	Fresh leaves juice internally used for asthma, expectorant, externally for antiseptic
Oldenlandia umbellate Linn. (S0161)	Rubiaceae	Imbural	The whole plant decoction is used internally to stop blood vomiting. Externally used for antiseptic for chronic wound
Rhinacanthus nasutus (Linn.) Kurz. (S5946)	Acanthaceae	Nagamalli	The leaves and stem parts are used in the treatment of hepatitis, diabetes, hypertension and skin disease. The roots are believed to be an antidote to the bites of poisonous snakes
Sida acuta Burm. F. (S1546)	Malvaceae	Aruvalmanai poondu	This plant is used as a complementary treatment for malaria or other febrile illnesses and the leaf extract combined with turmeric applied for chronic wound and poisonous bite

Table 1. Contd.

Theprosia purpurea (Linn.) Pers. (S114)	Fabaceae	Kolunchi	The roots and seeds are reported to have insecticidal and pesticidal properties and also used as vermifuge. The roots juice is also an effective medicine for leprous wound and eruption of skin
Trichodesma indicum (L.) R. Br. (S7489)	Boraginaceae	Kavizhthumbai	The leaves and the roots are esteemed as a remedy for snake bites; and also considered diuretic. A cold infusion of the leaves is considered depurative
Tridax procumbens Linn. (S6112)	Compositae	Kinatrati poondu	Traditionally, it is used for the treatment of bronchial catarrh, dysentery, malaria, stomachache, diarrhoea, high blood pressure and to check haemorrhage from cuts, bruises and wounds and also to prevent falling of hair
Toddalia asiatica (L) Lam (S0978)	Rutaceae	Milagaranai	Decoctions or infusions of the roots are drunk to treat malaria, fever and to cure stomachache. Strong decoction of the root is used as antiseptic wash to wound infection
Tylophora indica (Burm. F.) Merr. (S8564)	Asclepiadaceae	Nanjaruppan	This plant root and leaf extract are used in treatment of asthma, dermatitis and rheumatism. The plant has been described as bronchodilator, emetic, expectorant and diaphoretic. The leaf extract used internally as effective antidote for poisnous case and poisnous bite

Antibacterial activity of selected medicinal plants against pathogenic bacteria

The antibacterial activity was studied using the disc-diffusion method (Bauer et al., 1996). Bacteria were grown overnight on Muller Hinton (MH) agar plates, five young colonies were suspended with 5 ml of sterile saline (0.9%) and the density of the suspension adjusted to approximately 3×10^8 colony forming units (CFU). The swab was used to inoculate the bacteria over the dried surface of MH agar plate by rotating the plate to ensure an even distribution of the inoculums. The medium was allowed to dry for about 3 min before adding a sterile paper disc of 5 mm diameter. Each disc was tapped gently down onto the agar to provide uniform contact. Compounds (50 µg) were weighed and dissolved in 1 ml of 7% methanol. 5, 10, 15 and 20 µl/ml of the extract were introduced on each disc (three replicates) and 7% methanol alone served as a normal control. The plates were incubated at 37°C for 24 h; inhibition zones were measured and calculated.

Minimum inhibitory concentrations (MICs)

The minimum inhibitory concentrations of the crude extract were determined by dilution method (Brantner and Grein, 1994). The strains were grown in MH broth to exponential phase with an *A*560 of 0.8, representing 3×10^8 CFU/ml. Different dilutions of the 15 different medicinal plant were prepared to give concentrations of 5, 10, 15 and 20 µg/ml. 0.5 ml of each concentration was added into separate test tubes containing 4 ml of MH broth inoculated with 0.5 ml bacterial suspension at a final concentration of 10^8 CFU/ml. Each MIC was determined from five independent experiments performed in duplicate. The tubes containing 4.5 ml of bacterial inoculates and 0.5 ml of 7% methanol used as bacterial control, 4.5 ml of uninoculated MH broth and 0.5 ml PBS (Phosphate buffer saline) served as a blank. The tubes were incubated at 37°C for 18 h; inhibition of bacterial growth was determined by measuring the absorbance at 560 nm.

RESULT AND DISCUSSION

The present study revealed that the local people of Trichy district, Tamilnadu, India were using 15 species of medicinally important plants belonging to 11 families (Table 1). These medicinally important plants were categorized under four groups: 8 herbs, 2 shrubs, 4 climbers and 1 tree. The most medicinally important plant species were observed in Acanthaceae (3) followed by Asclepiadaceae (2), Compositae (2) and other four families. These medicinally important plants were commonly used to treat various diseases like fever, cough, diarrhea

dysentery, skin diseases, indigestion, worm infestations, wound healing, antiseptic, typhoid and as an antidote for poison. This is constant with the other general observation which has been reported earlier in relation to medicinal plant studies by the Indian Traditional System of Medicine like Siddha and Ayurvedha (Kirtikar and Basu, 2001; Gogte, 2000; Anonymous, 1992).

Different types of preparation made from medicinally important plants included decoction, juice, powder, paste and whole plant extract. Some plants were even used in more than one form of preparations. Majority of the plant preparation were in the form of decoction obtained from the roots, seeds, stem, leaves and flowers of *Elephantopus scaber, Toddalia asiatica,* and *Oldenlandia umbellata*. Preparations in the form of Juices were attained from the leaves of *Acalypha fruticosa, Mukia maderaspatensis* and *Theprosia purpurea*. The World Health Organization advocated that countries should interact with traditional medicine with a view on identifying and exploiting aspects that provide safe and effective remedies for ailments of both microbial and non-microbial origins (WHO, 1978).

External applications prepared from *Sida acuta* and *Lepidagathis cristata* were used to cure many diseases like skin diseases, wounds, rheumatism, poisonous bites and dandruff. The local people of the Trichy prescribed the medicinally important plants either as single or as in combination with several plants to cure various illnesses. The local people prepare medicines from stem and leaves of *Rhinacanthus nasutus* to cure the diseases of hepatitis, diabetic, herptension, skin diseases, and it also enhances the immunity power of the patients. In the modern research, this plant was found to contain rhinacanthin-C, rhinacanthin-D and rhinacanthin-N. They possessed antifungal, antibacterial, antiviral, anti-inflammatory, anti-allergic, haemorrhoid and various types of cancers curing properties (Gotoh et al., 2004; Puttarak et al., 2010). Although *R. nasutus* extract was capable to reduce hyperglycaemia in streptozotocin-induced diabetic rats, it could be a potential source for isolation of new orally active agent(s) for anti-diabetic therapy (Visweswara and Dhananjaya, 2010).

Data collected from the Trichy district were compared with available data in other districts of Tamilnadu like Kancheepuram and Villupuram. An interesting observation was that some medicinally important plants such as *E. scaber, Caralluma attenuate, Justicia simplex* and *Tridax procumbens,* were found to be practiced as important medicinal plants in Kancheepuram and Villupuram district for the treatment of various diseases like antispasmodics, skin diseases, cold, fever, wounds and abdominal problems.

Phytochemical screening of ethno medicinal plants

The result of phyotochemical screening showed that most of these 15 tested plants exhibited positive reactions to alkaloids, flavonoids, terpenoids and glycosides. However, tannins, saponins and anthroquinones were found only in very few plants as shown in Table 2. The results of screening of phytochemical assay justified that infusions and decoctions are usually good for extracting water soluble active ingredients such as glycosides, mucilage, alkaloids, polysaccharides and tannins, but are limited by their unpleasant taste, shelf life; and the poor solubility of many phytochemicals in water. Most of the plant alkaloid performs against bacteria DNA synthesis inhibition or destruction of cell wall; flavonoids binds to adhesins, complex with cell wall, inactivates enzymes in microbes; terpenoids are known for the main materials having various biological activities, including anti-tumor, anti-ulcer, anti-inflammatory, neuro-cytotoxic and cardiotonic activities (Audu et al., 2007; Jae Youl Cho et al., 2000). In our investigation of the ethno medicinal plants in Trichy district, out of fifteen plants, twelve plants possessed alkaloids, thirteen plants possessed flavonoids and terpenoids.

Antibacterial activity of selected enthno medicine plants

The result of the antibacterial screening of the methanolic leaf extracts of all the fifteen ethano medicinal plants against five bacteria species were summariezed in Table 3 (inhibition zones in the disc diffusion assay) and Table 4 (MIC values). All the bacteria tested were found to be sensitive to the methanolic extracts of the plants studied.

The result of the zone of inhibition study revealed that the extracts possess antibacterial activity in a concentration depended manner against the tested organisms. However *T. procumbens* and *Tylophora indica* were found to be more active against the pathogenic bacteria. Evenmore, *S. aureus* (gram positive) was observed to be more susceptible than *E. coli, V. cholera, P. aeruginosa,* and *P. mirabli*s (gram negative). The results of MIC study revealed the antibacterial activity of the extracts against the tested strains of the bacteria between the concentrations of 5 to 20 µl/ml. The observation showed that *T. procumbens* and *T. indica* were more effective against the tested pathogens. Similar accordance results were described on effects of n-hexane extract of the flowers which showed activity against *E. coli*. Ethyl-acetate extract of the *T. procumbens* flowers showed activity against *Bacillus cereus* and *Klebsiella* sp. whereas the ethyl acetate extract of aerial parts showed activity only against *Mycobacterium smegmatis* and *S. aureus* (Mahato and Chaudhary, 2005; Oladunmoye, 2006).

Antimicrobials of plant origin have enormous therapeutic potential and have been used since time immemorial. In classifying the antibacterial activity as gram-positive or gram-negative, it would generally be expected that a much greater number would be active against gram-positive than gram-negative bacteria (MC Cutcheon et al.,

Table 2. Phytochemical screening of ethno medicinal plants

Ethnomedicinal plant	Observation of phytochemical constituents						
	Alkaloids, mayers test	Flavonoids, alkalai reagent	Glycosides, Bornbager's test	Tannins, $FeCl_3$ test	Saponins, frothing test	Terpenoids, nollers test	Anthraquinones, benzene ammonia test
Acalypha fruticosa	+	+	-	-	-	+	-
Caralluma attenuate	-	+	+	+	-	+	+
Cissampelos pareira	+	+	-	-	-	+	+
Elephantopus scaber	+	+	+	-	-	+	-
Justicia simplex	+	+	-	-	-	+	-
Lepidagathis cristata	+	-	+	+	-	+	-
Mukia maderaspatensis	-	-	+	-	-	-	-
Oldenlandia umbellata	+	+	+	-	-	+	-
Rhinacanthus nasutus	+	+	-	-	+	+	+
Sida acuta	+	+	-	-	-	+	+
Theprosia purpurea	+	+	+	+	-	+	+
Trichodesma indicum	-	+	-	+	-	-	+
Tridax procumbens	+	+	+	+	-	+	-
Toddalia asiatica	+	+	+	+	+	+	+
Tylophora indica	+	+	+	+	-	+	-

-Negative (absent), +positive (present).

Table 3. Antibacterial activity of fifteen methanol extracts of ethano medicinal plant against bacterial species tested by disc diffusion assay.

Botanical Name	*Escherichia coli*				*Vibrio cholerae*				*Staphylococcus aureus*			
	5 g/ml	10 g/ml	15 g/ml	20 g/ml	5 g/ml	10 g/ml	15 g/ml	20 g/ml	5 g/ml	10 g/ml	15 g/ml	20 g/ml
Acalypha fruticosa	11.5±0.5	12.6±0.76	13.8±0.28	15.8±0.76	9.6±0.76	10.8±0.76	12.8±0.76	14.6±0.76	11.03±0.5	13.4±0.5	15.4±0.4	17.1±0.55
Caralluma attenuate	10.3±0.2	12.0±0.32	13.7±0.5	15.1±0.34	8.3±0.73	10±0.14	11.3±0.62	13.4±0.5	9.09±0.23	11.4±0.36	13±0.23	15±0.13
Cissampelos pareira	6.3±0.8	7.8±0.50	9.4±0.32	10.6±0.25	7.2±0.27	9.1±0.42	10.6±0.23	12±0.5	6.7±0.36	8.3±0.21	9.8±0.36	11.2±0.61
Elephantopus scaber	10.5±0.5	12.2±0.25	14.5±0.5	16.2±0.25	8.1±0.32	10.5±0.50	12.3±0.57	14.1±	9.1±2.8	10.83±0.76	13±0.5	14.1±0.28
Justicia simplex	6.9±0.6	8.8±0.72	11.3±0.3	13.9±0.40	7±1	8.5±0.5	9.6±0.30	12.6±0.32	8.7±0.26	9.1±0.76	11.9±0.81	14.03±0.55
Lepidagathis cristata	8.03±0.55	11.6±0.32	13.2±0.60	15.06±0.60	7.5±0.5	10.56±0.73	12.5±0.5	14.6±0.36	9.4±0.40	11.8±0.72	14±0.3	16. 3±0.26
Mukia maderaspatensis	6±0.5	8.4±0.51	9.8±0.28	11.5±0.5	7.8±0.76	10.5±0.60	11.9±0.40	13.03±0.45	7.5±0.5	9.8±0.76	11±0.6	12±0.5
Oldenlandia umbellata	6.9±0.40	8.5±0.5	10.03±0.45	12.9±0.55	6.9±0.60	9.3±0.3	10.9±0.45	13. ±0.5	8±0.5	10.2±0.60	12.5±0.46	14.2±0.65
Rhinacanthus nasutus	8.6±0.36	10.5±0.41	12.9±0.50	14.8±0.56	7.7±0.68	10.5±0.51	11.9±0.65	13.7±0.68	10.8±0.72	11.7±0.77	12.03±0.25	13.4±0.30
Sida acuta	8.6±0.21	10.1±0.48	11.6±0.72	13.4±0.26	7.8±0.43	9.4±0.71	10.7±0.28	12.6±0.13	6.4±0.31	7.9±0.5	9.5±0.14	11±0.21
Theprosia purpurea	6.6±0.14	8.3±0.46	9.7±0.2	11.3±0.46	7.5±0.71	9.2±0.14	10.8±0.41	12±0.35	6±0.34	7.4±0.8	9.2±0.43	10.4±0.18
Trichodesma indicum	6.1±0.56	9.6±0.61	9.3±1.00	13.7±0.54	6.9±0.79	11.13±0.47	12.53±0.50	13.23±0.75	8.5±0.40	10.9±0.55	11.03±0.45	12.5±0.5
Tridax procumbens	13.7±0.62	16.3±0.72	20.9±0.83	23.7±0.32	12.5±0.45	15.1±0.37	19.4±0.89	23.9±0.7	14.03±0.55	16.9±0.36	21.3±0.35	24.6±0.36
Toddalia asiatica	8.3±0.36	10.4±0.16	11.7±0.43	13.1±0.5	7.5±0.15	9.3±0.7	10.5±0.53	12±0.13	9.4±0.47	10.7±0.44	12±0.13	13.6±0.14
Tylophora indica	13.5±0.60	16.3±0.75	20.6±0.79	23.8±0.61	12.2±0.34	14.9±0.55	19.4±0.89	24.1±0.41	14±0.6	16.8±0.41	21.4±0.36	25.3±0.35

Table 3. Contd.

	Proteus mirabilis				*Pseudomonas aeruginosa*			
Acalypha fruticosa	8.7±0.64	10.6±0.79	12.4±0.40	14.05±0.45	11.5±0.5	12.5±0.6	14.1±0.36	16.06±0.40
Caralluma attenuate	9±0.2	9.9 ±0.05	12±0.4	13.7±0.3	8.2±0.3	10±0.4	12.3±0.21	14..8±0.36
Cissampelos pareira	7.0±0.13	8.6±0.7	10.12±0.5	12.04±0.2	6.7±0.71	8.0±0.4	9.1±0.36	11.06±0.71
Elephantopus scaber	8.6±0.57	11.5±0.86	12.8±0.76	15.5±0.5	10.1±0.28	12.7±0.25	13.6±0.76	15.6±0.76
Justicia simplex	6.4±0.56	8.4±0.51	10.9±0.40	12.9±0.45	8.8±0.80	10.7±0.68	13.5±0.50	15.1±0.73
Lepidagathis cristata	9±0.6	12.2±0.64	14.4±0.41	15.4±0.65	10.5±0.66	13.1±0.65	13.9±0.47	16.1±0.26
Mukia maderaspatensis	7.5±0.81	8.3±1.17	9.1±0.28	10.9±0.36	9.5±0.60	10.8±0.52	11.9±0.60	13.5±0.61
Oldenlandia umbellata	5.9±0.48	8.6±0.76	10.1±0.45	12.8±0.41	7.3±0.75	11.1±1.0	12.5±0.5	13.60.32
Rhinacanthus nasutus	6.9±0.65	8.5±0.40	10.9±0.9	12.9±0.55	10.1±0.75	12.5±0.50	13.9±0.35	16.5±0.73
Sida acuta	6.1±0.14	7.5±0.63	9.0±0.7	11±0.21	5.5±0.26	6.4±0.15	7.4±0.41	8.9±0.16
Theprosia purpurea	7.6±0.3	9.6±0.27	10.6±0.51	11.8±0.5	5.7±0.16	6.9±0.39	8.4±0.46	9.7±0.36
Trichodesma indicum	8.5±0.37	10.03±0.45	11.5±0.5	12.6±0.36	6.0±0.45	6.8±0.47	8.9±0.36	10.53±0.50
Tridax procumbens	11.7± 0.70	13.9±0.72	17.6±0.77	21.8±0.72	11.9±0.45	16.6±0.61	20.5±0.66	23.7±0.76
Toddalia asiatica	9.9±0.16	11.3±0.5	13.4±0.11	14.7±0.32	8.5±0.24	9.8±0.47	11.3±0.36	12.8±0.43
Tylophora indica	11.6±0.55	14.1±0.37	17.4±0.89	21.7±0.68	12±0.2	16.7±0.62	20.4±0.45	23.8±0.80

*The antimicrobial activity was determined by measuring the diameter of zone of inhibition, that is, the mean of triplicates±SD of triplicates.

Table 4. Minimal inhibitory concentration (MIC) of fifteen methanol extracts of ethano medicinal plant against bacteria.

Botanical name	*Escherichia coli*					*Vibrio cholerae*				
	Control	5 µg/ml	10 µg/ml	15 µg/ml	20 µg/ml	Control	5 µg/ml	10 µg/ml	15 µg/ml	20 µg/ml
Acalypha fruticosa		0.549±0.03	0.440±0.03	0.337±0.04	0.206±0.01		0. 0.538±0.03	0.457±0.03	0.339±0.02	0.215±0.01
Caralluma attenuate		0.571±0.01	0.437±0.02	0.354±0.04	0.223±0.01		0.613±0.02	0.505±0.01	0.421±0.03	0.304±0.01
Cissampelos pareira		0.634±0.01	0.543±0.03	0.372±0.01	0.214±0.01		0.563±0.01	0.461±0.04	0.328±0.01	0.208±0.02
Elephantopus scaber		0.510±0.01	0.413±0.02	0.312±0.01	0.208±0.01		0. 0.594±0.01	0.460±0.02	0.333±0.05	0.209±0.03
Justicia simplex		0.666±0.03	0.522±0.05	0.476±0.01	0.311±0.04		0. 0.578±0.04	0.476±0.03	0.340±0.02	0.246±0.02
Lepidagathis cristata		0.555±0.02	0.434±0.01	0.313±0.01	0.237±0.03		0. 0.607±0.02	0.532±0.02	0.454±0.02	0.383±0.01
Mukia maderaspatensis		0.579±0.05	0.462±0.07	0.296±0.01	0.233±0.04		0.660±0.04	0.569±0.09	0.469±0.04	0.409±0.06
Oldenlandia umbellata	0.753±0.06	0.675±0.02	0.550±0.02	0.464±0.03	0.333±0.01	0.797±0.01	0. 0.586±0.02	0.441±0.03	0.359±0.03	0.273±0.02
Rhinacanthus nasutus		0.653±0.01	0.526±0.02	0.464±0.02	0.332±0.02		0. 0.663±0.02	0.584±0.01	0.418±0.01	0.353±0.03
Sida acuta		0.634±0.01	0.510±0.03	0.383±0.04	0.248±0.02		0.487±0.02	0.383±0.03	0.274±0.01	0.210±0.1
Theprosia purpurea		0.557±0.03	0.441±0.01	0.309±0.01	0.283±0.01		0.639±0.01	0.549±0.02	0.426±0.03	0.341±0.09
Trichodesma indicum		0.544±0.02	0.425±0.01	0.315±0.01	0.213±0.01		0.580±0.01	0.459±0.03	0.364±0.04	0.241±0.04
Tridax procumbens		0.396±0.05	0.245±0.01	0.142±0.01	0.106±0.0		0.367±0.02	0.247±0.03	0.172±0.01	0.107±0.01
Toddalia asiatica		0.593±0.01	0.443±0.04	0.343±0.05	0.216±0.03		0.650±0.03	0.525±0.01	0.297±0.01	0.201±0.01
Tylophora indica		0.415±0.01	0.274±0.01	0.224±0.03	0.183±0.02		0.347±0.02	0.225±0.02	0.153±0.01	0.084±0.01

Table 4. Contd.

		Proteus mirabilis					***Pseudomonas aeruginosa***			
Acalypha fruticosa		0.627±0.02	0.551±0.02	0.462±0.01	0.328±0.01		0.479±0.02	0.398±0.02	0.285±0.02	0.174±0.01
Caralluma attenuate		0.533±0.01	0.437±0.04	0.306±0.01	0.223±0.03		0.527±0.03	0.498±0.01	0.311±0.04	0.201±0.04
Cissampelos pareira		0.581±0.03	0.435±0.05	0.319±0.01	0.199±0.04		0.593±0.02	0.526±0.01	0.413±0.03	0.276±0.01
Elephantopus scaber		0.667±0.04	0.506±0.03	0.384±0.05	0.230±0.02		0.483±0.05	0.399±0.01	0.282±0.02	0.204±0.03
Justicia simplex		0.697±0.07	0.581±0.03	0.476±0.03	0.412±0.01		0.447±0.03	0.359±0.02	0.226±0.02	0.185±0.02
Lepidagathis cristata		0.557±0.02	0.473±0.02	0.357±0.02	0.283±0.01		0.439±0.02	0.327±0.01	0.241±0.02	0.169±0.02
Mukia maderaspatensis		0.712±0.04	0.587±0.04	0.455±0.06	0.382±0.01		0.482±0.03	0.345±0.02	0.296±0.04	0.153±0.01
Oldenlandia umbellata	0.778±0.04	0.629±0.03	0.569±0.03	0.430±0.02	0.343±0.03	0.603±0.02	0.430±0.02	0.351±0.02	0.279±0.02	0.145±0.01
Rhinacanthus nasutus		0.651±0.02	0.559±0.02	0.438±0.01	0.355±0.02		0.447±0.01	0.356±0.02	0.294±0.01	0.135±0.02
Sida acuta		0.541±0.01	0.424±0.01	0.301±0.01	0.178±0.01		0.571±0.03	0.453±0.01	0.301±0.01	0.178±0.01
Theprosia purpurea		0.646±0.03	0.543±0.02	0.413±0.01	0.314±0.02		0.653±0.01	0.523±0.01	0.427±0.03	0.289±0.01
Trichodesma indicum		0.647±0.03	0.557±0.02	0.424±0.01	0.332±0.01		0.499±0.02	0.417±0.03	0.350±0.01	0.220±0.02
Tridax procumbens		0.376±0.02	0.270±0.02	0.162±0.02	0.099±0.02		0.372±0.02	0.277±0.01	0.197±0.01	0.094±0.02
Toddalia asiatica		0.631±0.01	0.534±0.03	0.401±0.03	0.274±0.02		0.563±0.01	0.421±0.01	0.314±0.01	0.272±0.01
Tylophora indica		0.350±0.02	0.237±0.01	0.142±0.02	0.075±0.01		0.343±0.01	0.235±0.02	0.161±0.02	0.067±0.02

Botanical name		***Staphylococcus aureus***			
Acalypha fruticosa		0.541±0.02	0.452±0.02	0.328±0.02	0.218±0.01
Caralluma attenuate		0.643±0.03	0.528±0.05	0.400±0.01	0.278±0.01
Cissampelos pareira		0.600±0.03	0.511±0.02	0.403±0.01	0.297±0.03
Elephantopus scaber		0.729±0.04	0.606±0.04	0.476±0.04	0.428±0.05
Justicia simplex		0.652±0.02	0.586±0.02	0.493±0.02	0.354±0.02
Lepidagathis cristata		0.554±0.01	0.440±0.01	0.357±0.0	0.240±0.02
Mukia maderaspatensis		0.719±0.02	0.617±0.05	0.498±0.03	0.438±0.03
Oldenlandia umbellata	0.834±0.03	0.645±0.02	0.562±0.01	0.435±0.02	0.361±0.01
Rhinacanthus nasutus		0.584±0.03	0.465±0.02	0. 345±0.01	0.295±0.01
Sida acuta		0.550±0.02	0.448±0.02	0.330±0.02	0.220±0.01
Theprosia purpurea		0.590±0.02	0.465±0.05	0.336±0.01	0.257±0.02
Trichodesma indicum		0.752±0.01	0.641±0.01	0.516±0.02	0.456±0.02
Tridax procumbens		0.356±0.03	0.263±0.01	0.160±0.01	0.099±0.01
Toddalia asiatica		0.543±0.03	0.428±0.02	0.272±0.03	0.189±0.03
Tylophora indica		0.365±0.02	0.283±0.02	0.194±0.03	0.104±0.01

1992). In the present findings, most of those methanol extracts of ethano medicinal plants showed activity against gram-positive bacteria (*S. aureus)*, supporting the above view. However, the numbers of bacteria used in screening have been restricted to five: four gram-negative *(P. aeruginosa, E. coli, V. cholerae* and *P. mirablis*) and one gram-positive (*S. aureus*) due to limitation of resources.

Conclusion

This study showed that the study area has plenty of medicinal plants to treat a wide spectrum of human ailments. Many people in the study areas of the Trichy district of Tamilnadu, India are still depending on medicinal plants, at least for the treatment of some simple diseases such as, cold, cough, fever, headache, poison bites, skin diseases and tooth infections. It is necessary to acquire and preserve this traditional system of medicine by proper documentation and identification of specimens. This traditional knowledge on the indigenous uses of the medicinal plants could boost new innovations in the pharmaceutical industry and have many beneficial applications such as new medicinal trails for some diseases like: bacterial diseases, cancer, tuberculosis, malaria, and acquired immund deficiency syndrome (AIDS), which will develop the health care sector in India. Finally, this research article will attract the attention of ethno botanists, phytochemists and pharmacologists for further critical investigation of medicinal plants present in the districts of Tamilnadu, India.

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