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<p><b>An Ethnobotanical survey and study of medicinal plants used by the local people of Gingee (Villupuram district) in Tamilnadu</b></p>		
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<p><b>History of Article:</b></p> <p>Received 22 September 2015 Received in revised from 27 September 2015 Accepted 15 October 2015 Available online 25 October 2015</p>	<p><b>ABSTRACT</b></p> <p>This paper represents the first large-scale ethnobotanical study in the Gingee and its surrounding (Villupuram district). This is the first ethnobotanical study in which statistical calculations about plants are done by ICF (Informant Consensus Factor) method. This study aimed to identify plants collected for medicinal purposes by the local people of Gingee, located in the Villupuram district of Tamilnadu and to document the traditional names, preparation and uses of these plants. Field research was conducted by collecting ethnobotanical information during structured and semi-structured interviews with native knowledgeable people in territory. A total of 15 medicinal plants belonging to 9 families were identified in the region. These plants, used in the treatment of many different diseases, are freely harvested in this region at abundant amounts. Due to the increasing health service facilities in the area, herbal medicine, seemed to be more related to health care and disease prevention than cure.</p> <p><b>Keywords:</b> Medicinal plants, local people, chemical constituents.</p>	

## INTRODUCTION

India is commonly called the Botanical Garden of the world, owing to her wealth of herbal medicines. India with its great topographic and climatic diversity has a very rich and diverse flora and fauna. The uses of plants as medicines have been practiced from an ancient time. From around 1500 B.C. Rig Veda is one of the important earliest available documents which emphasizes about herbal medicinal knowledge. Later on Indian herbalists such as Maharshi Charaka and Sushruta worked in search of different herbal plant parts for different ailments of human body. Herbal medicine is the study and use of medicinal properties of plants. Therefore medicinal plants constitute precious resources for mankind. Among the Angiospermic plants, 420,000 flowering plants were reported from the world (Govaerts, 2001) and many tropical species are not yet named. More than 50,000 plants have

been used for medicinal purposes (Schippmann *et al.*, 2002). India is blessed with two (Eastern Himalayas and Western Ghats) of the eighteen worlds' hotspots of plant biodiversity and is seventh among the sixteen Mega diverse countries, where 70% of the world's species occur collectively. In India, there are over 17,500 species of higher plants, 64 gymnosperms, 1,200 pteridophytes, 2,850 bryophytes, 2,021 lichens, 15,500 fungi and 6,500 algae are reported. In India, the main traditional systems of medicine include Siddha Ayurveda and Unani uses over 7,500 plant species have been reported. Traditional healers provide considerable information about the use of many plants or plant parts as medicine. Herbal medicines are assumed to be of great importance in the primary healthcare of individuals (Sheldon *et al.*, 1997) and communities in many developing countries as the herbal medicines are comparatively safer than synthetic drugs.

Ethno-medicinal studies are a suitable source of information regarding useful medicinal plants that can be targeted for domestication and management (Kunwar and Duwadee, 2003). Documenting the native knowledge through ethnobotanical studies is significant for the conservation and utilization of biological resources. In India, many indigenous plants are used in herbal medicine to cure diseases and heal injuries. Tribal people have been in the practice of preserving a rich heritage of information on medicinal plants and their usage. If this information is yet to be collected systematically and comprehensively and maintained in databases in a manner they would help in protecting their knowledge. The objective of this study is to document the traditional medicinal plants used by the peoples of Gingee Taluk, Villupuram district, Tamilnadu, India.

## MATERIAL AND METHODS

### Survey of ethno botanical properties of Jawadhu hills Thiruvanamalai

In order to assess the consumption of indigenous medicinal plants, survey was carried out during the year, 2015 in the forest areas of Jawadhu hills, Thiruvanamalai 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 inhabitants were interviewed. Randomly people were selected 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). Information on medicinal plants, local name, plant parts used and mode of administration for curing diseases has been recorded. Plants collected during the surveys were identified with the help of published regional flora (Gamble, 1935; Matthew, 1983). The identified plant specimens were then confirmed with the herbaria of botanical SURVEY of India

(BSI), Southern circle, Coimbatore, India. The specimens were deposited in the Herbarium, Department of Botany, Presidency College, Chennai 600 005. Voucher specimen numbers along with other details are given in (Table 1) and the collected data contains the list of plants of different families with their traditional uses, plant parts used and their mode of administration which are listed in alphabetical order.

### Ailment categories

Based on the information obtained from the traditional healers in the study area, all the reported ailments were categorized into 15 categories (Table 1) viz. gastro-intestinal ailments (GIA), dermatological infections/diseases (DID), respiratory systems diseases (RSD), genito-urinary ailments (GUA), fever (Fvr), skeletomuscular system disorders (SMSD), poisonous bites (PB), circulatory system/cardiovascular diseases (CSCD), endocrinal disorders (ED), liver problems (LP), dental care (DC), hair care (HC), ear, nose, throat problems (ENT), cooling agents (CA) and general health (GH). Several diseases were placed in one ailment category based on the body systems treated.

### Data analysis

#### Informant consensus factor (Fic)

The informant consensus factor (Fic) was used to see if there was agreement in the use of plants in the ailment categories between the plant users in the study area. The Fic was calculated using the following formula (Heinrich *et al.*, 1998):

$$F_{ic} = \frac{N_{ur} - N_t}{N_{ur} - 1}$$

Where Nur refers to the number of use-reports for a particular ailment category and Nt refers to the number of taxa used for a particular ailment category by all informants. The product of this factor ranges from 0 to 1. A high value (close to 1.0) indicates that relatively few taxa are used by a large proportion of the informants. A low value indicates that the informants disagree on the taxa to be used in the treatment within a category of illness.

#### Use value (UV)

The relative importance of each plant species known locally to be used as herbal remedy is reported as use value (UV) and it was

calculated using the following formula (Phillips *et al.*, 1994):

$$UV = \frac{\sum U}{n}$$

Where UV is the use value of a species, U is the number of use reports cited by each informant for a given plant species and n is the total number of informants interviewed for a given plant. The UV is helpful in determining the plants with the highest use (most frequently indicated) in the treatment of an ailment. UVs are high when there are many use-reports for a plant and low when there are few reports related to its use.

#### Fidelity level (FL)

To determine the most frequently used plant species for treating a particular ailment category by the informants of the study area, we calculated the fidelity level (FL). The FL was calculated using the following formula (Friedman *et al.*, 1986):

$$FL \% = \frac{N_p}{N} \times 100$$

Where  $N_p$  is the number of use-reports cited for a given species for a particular ailment category and N is the total number of use reports cited for any given species. Generally, high FLs are obtained for plants for which almost all use-reports refer to the same way of using it, whereas low FLs are obtained for plants that are used for many different purposes (Srithi *et al.*, 2009).

#### Relative importance (RI)

We calculated the relative importance (RI) of each medicinal plant based on the normalized number of pharmacological properties (PH) attributed to it and the normalized number of body systems (BS) it treated. Data on medicinal uses were organized according to the PH attributed to each taxon (e.g. analgesic, anti-inflammatory etc.) and to the specific body systems treated (e.g. skin diseases, fever, asthma etc.). The RI was calculated using the following formula (Bennett and Prance, 2000)

$$RI = \frac{Re\ PH + Rel\ BS}{2} \times 100$$

Where RI is the relative importance, PH is the number of reported pharmacological properties for the given plant, ReIPH is the relative number of pharmacological properties (PH of a given plant/maximum PH of all reported species), BS is the number of body systems treated and Rel BS is the relative number of body systems treated (BS of a given plant/maximum BS of all reported species).

## RESULT AND DISCUSSION

### Documentation of indigenous ethnomedicinal knowledge from the traditional healer of Gingee Taluk, Villipuram district

The present study revealed the use of 15 species of plants distributed in 13 genera belonging to 9 families which were commonly used by most of the Gingee taluk traditional healers for the treatment of 15 types of ailments. The prominent family was Fabaceae with four species, followed by Solanaceae and Lamiaceae with three and two species respectively. For each reported species were provided the botanical name of the plant, family, voucher specimen number, local (Tamil) name, life form, use value, parts used, ailments treated, method of preparation, mode of administration and relative importance (Table-1).

The medicinal uses of plants gathered in our study were compared with the previously published information from other parts of India. In this present study found that there were 15 claims from the plants such as *Acacia leucophloea*, *Argemone mexicanana*, *Cissus quadrangularis*, *Datura metel*, *Ocimum sanctum*, *Theprosis purpurea*, *Clitoria ternatea*, *Indigofera aspelathoides*, *Indigofera tinctoria*, *Ficus benghalensis*, *Leucas aspera*, *Phyllanthus amarus*, *Solanum indicum*, *Solanum trilobatum*, *Tribulus terrestris*, were reported for the first time from the study area (new claims were given with asterisk mark in Table-1). However, no plants were reported as a new medicinal plant as all the plants were reported with different uses.

**Table-1. List of commonly herb medicinal used plants of Jawadhu Hills Traditional healer**

Botanical Name	Family	Habit	Vernacular Name	Part Used	Mode of Preparation	Medicinal properties
<i>Acacia leucophloea</i> (Roxb.) Willd.	Mimosaceae	Tree	Sarai	Stem bark	Decoction	Bark and leaves are used for treating renal edema, cardiac edema and indigestion. Leaf juice is administered to treat fever and stomachache and, mixed with cow's milk, to bleeding piles.
<i>Argemone mexicana</i> L.	Papaveraceae	Herb	Bhiramathantu	Latex and stem	Direct application	The latex juice of the plant was mixed with water for skin diseases, and the flowers used for chest complaints and as a narcotic.
<i>Cissus quadrangularis</i> L. Mant.	Vitaceae	Climber	Pirantai	Stem	Fry	This plant stem used for the treatment of osteoarthritis, rheumatoid arthritis and osteoporosis. The stem juice of plant is used to treat scurvy, menstrual disorders, otorrhoea and epistaxis.
<i>Clitoria ternatea</i> L.	Fabaceae	Climber	Sangupoo	Seed	Powder	The roots of Clitoriaternatea have great medicinal value. They can be powdered and consumed. They cure whooping cough in an instant manner. The herb also cures cold and asthma present in people.
<i>Datura metel</i> L.	Solanaceae	Shrub	Oomathai	Leaf and seed (Poison)	Smoke and purify with cow milk	Some medicinal uses of the plant are its anti-inflammatory property of all parts of the plant, stimulation of the central nervous system, respiratory decongestion, treatment of dental and skin infections, alopecia.
<i>Ficus benghalensis</i> L.	Moraceae	Tree	Alamaram	Leaf	Extract and powder	Leaves are good for ulcers, aerial roots are useful in gonorrhoea, seeds and fruits are cooling and tonic. The roots of <i>Ficus benghalensis</i> are given for obstinate vomiting and infusion of its bark is considered as a tonic and astringent and is also used in diarrhoea, dysentery and diabetes. Milky juice (latex) of stem bark for the

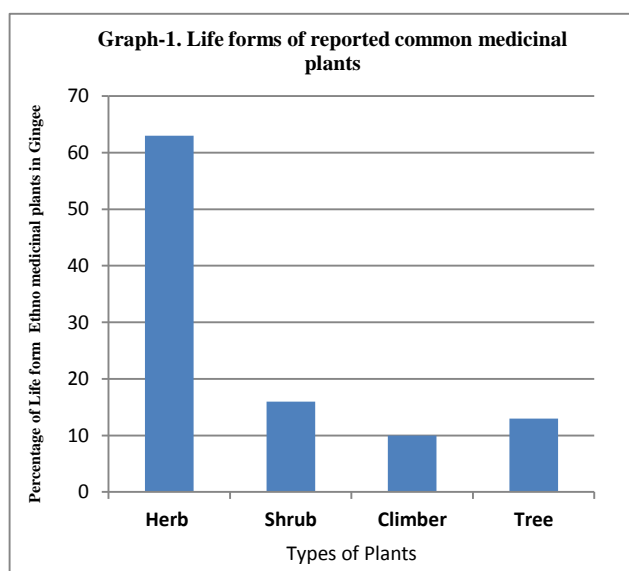
						treatment of rheumatism and other inflammatory diseases
<i>Indigofera aspelathoides</i> Vahl ex Dc.	Fabaceae	Herb	Sivanarve mbu	Root	Oil	This plant combine with sesam oil is used in the form of demulcent for the treatment of leprosy and cancer.
<i>Indigofera tinctoria</i> L.	Fabaceae	Herb	Avuri	Whole plant	Powder	The roots, stems and leaves of <i>Indigoferatinctoria</i> are bitter, thermogenic, laxative, trichogenous, expectorant, anthelmintic, gastropathy, splenomegaly, cephalalgia, cardiopathy, hepatoprotective anticancer, epilepsy, neuropathy.
<i>Leuca saspera</i> (Willd.)	Laniaceae	Herb	Thumbai	Flower	Flower boil with cow milk	The plant is used traditionally as an antipyretic and insecticide. Flowers are valued as stimulant, expectorant, aperient, diaphoretic, insecticide and emmenagogue. Leaves are considered useful in chronic rheumatism, psoriasis and other chronic skin eruptions.
<i>Ocimum sanctum</i> L.	Lamiaceae	Herb	Thulsi	Leaf	Decoction	It have been recommended for the treatment of bronchitis, bronchial asthma, malaria, diarrhea, dysentery, skin diseases, arthritis, painful eye diseases, chronic fever, insect bite.
<i>Phyllanthus amarus</i> Schum. &Thonn.	Euphorbiaceae	Herb	Kizhkaine lli	Whole plant	Fresh water extract with Goat milk	Fresh extract of the plant combine with goat milk used for problems of stomach, genitourinary system, liver, kidney and spleen. It is bitter, astringent, stomachic, diuretic, febrifuge and antiseptic. The whole plant is used in gonorrhoea, menorrhagia and other genital affections.

<i>Solanum indicum L.</i>	Solanaceae	Herb	Karimulli	Seed	Powder	Seeds are used as folk medicine for the treatment of inflammation toothache, ascites, oedema and wound infection.
<i>Solanum trilobatum L.</i>	Solanaceae	Climber	Thuthuvelai	Leaf	Leaf fry with sesame oil	Leaves fry with ghee to cure numerous diseases viz., respiratory problems and bronchial asthma. The leaf extracts are used to increase male fertility and to cure snake poison
<i>Theprosi spurpurea (L.) Pers.</i>	Fabaceae	Herb	Kozhingi	Whole plant	Powder	The dried herbs are effective as tonic laxative, diuretics, deobstruent and used in the treatment of bronchitis, bilious febrile attack, boils, pimples and bleeding piles.
<i>Tribulus terrestris L.</i>	Zygophyllaceae	Herb	Neringil	Whole plant	Powder	Tribulus is very well utilized through many formulations. Its cleansing effect on urinary system, its usage in urinary calculi suggests towards its diuretic activity.

### Ethno medicinal plants of Life form and parts used in Gingee Taluk Villipuram district

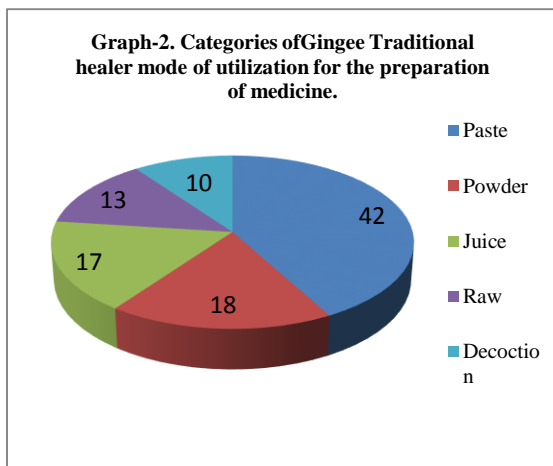
Herbs were the primary source of medicine (63%) followed by trees (13%), shrubs (16.6%) and climbers (10%) (Graph-1). The frequent use of herbs among the indigenous communities is a result of wealth of herbaceous plants in their environs (Tabuti et al., 2003; Ragupathy et al., 2008; Giday et al., 2010) and Tirunelveli hills harbours more number of herbs as compared to trees, shrubs and climbers (Manickam et al., 2004). Among the different plant parts used, the leaves (50%) were most frequently used for the preparation of medicine solely or mixed with other plant parts. It was followed by Seed (23.3%), whole plant (33.3%), Leaves (36.6%), stem (4%), seed (3%, including seed oil), latex, root, root bark, resin and young twig (1% each) (Graph-2). Many indigenous communities elsewhere also utilized mostly leaves for the preparation of herbal medicines (Giday et al., 2010; Gonzalez et al., 2010). The reason why leaves were used mostly is that they are collected very easily than underground parts,

flowers and fruits etc. (Giday et al., 2009) and in scientific point of view leaves are active in photosynthesis and production of metabolites (Ghorbani, 2005).



### Method of preparation and mode of administration of ethno medicinal plants in traditional users of Gingee

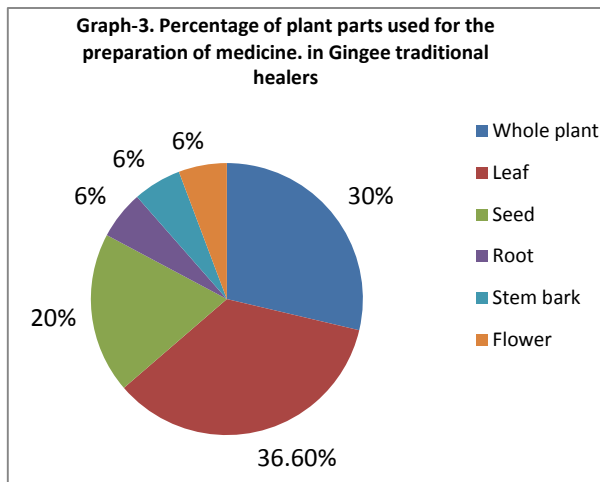
The preparation and utilization of plant parts were grouped into five categories (Graph-2). Of these, most commonly used method of preparation was paste (42%) followed by powder (18%), juice (17%), raw (13%), taken as raw and plant part prepared as pickles) and decoction (10%). Preparation of paste for the treatment of ailments is a common practice among the other tribal communities in India (Ignacimuthu et al., 2006; Ragupathy et al., 2008; and other parts of the World (Giday et al., 2007, 2010; Roosita et al., 2008). The paste was prepared by grinding the fresh or dried plant parts with oil or water. The powder was prepared by the grinding of shade dried plant parts. The decoction was obtained by boiling the plant parts in water until the volume of the water reduced to minimum or required amount. The inhalation was done by the burning of plant parts and inhaled the smoke through nose or mouth.



### Plant parts used for the preparation of medicine

Among the different plant parts used, the leaves (42%) were most frequently used for the preparation of medicine solely or mixed with other plant parts. It was followed by, whole plant (30%), stem bark and flower (6%), seed (20%, including seed oil), and root (6%) (Graph-3). Many indigenous communities elsewhere also utilized mostly leaves for the preparation of herbal medicines (Gonzalez et al., 2010). The reason why leaves were used mostly is that they

are collected very easily than underground parts, flowers and fruits etc. (Giday et al., 2009) and in scientific point of view leaves are active in photosynthesis and production of metabolites (Ghorbani, 2005).



### Method of administration of ethno medicinal plants recommended in Gingee traditional healers

Internal uses (64%) were predominating over external or topical uses (32%) and nasal application. For topical use, the most important methods used were direct application of paste or medicated oil (with oil) and mostly dealt with diseases like skin disorders, wounds, heel cracks, poison bites, rheumatism, body pain and headache. Most of the medicines were given orally which is in agreement with some other studies conducted elsewhere (Lee et al., 2008; Poonam and Singh, 2009).

### Plant use values

The most commonly used species was *Solanum trilobatum* with 9 use-reports by 4 informants, giving the highest use value of 2.00. *S. trilobatum* is attributed to its use in the treatment of various diseases and it is well recognized by all the informants as an respiratory plant. Many traditional healers' (Maruthuvar) families in Villupuram district of Tamil Nadu, India are growing *S. trilobatum* as a climbing vine in their home and it was a household custom to consume one leaf a day (Ragupathy and Newmaster, 2009). Other important plants with high use value were *Ocimum sanctum*, *Eclipta alpa*, *Wedelia chinensis*, *Ageratum conyzoides*,



*Vernonia anthelmintica*, *Theprosis purpurea*, *Clitoria ternatea*, *Indigofera aspelathoides*, *Indigofera tinctoria* (11 use reports by 6 informants with a UV of 1.83), *Hibiscus rosa sinensis*, *Leucas aspera*, *Melia azedarach*, *Phyllanthus amarus*, *Portulaca quadrifida*, *Solanum indicum*, *Solanum trilobatum*, *Tribulus terrestris*, *Datura metel*, *Evolvulus nummularius* (10 use-reports by 6 informants with a UV of 1.67), *Abutilon indicum*, *Acacia leucophloea*, *Achyranthes aspera*, *Argemone mexicana* (nine use-reports by six informants with a UV of 1.50). Most of these plants were frequently used by the Paliyar tribals in Theni district of Tamil Nadu (Ignacimuthu et al., 2008) and tribal practitioners of Eastern Rajasthan (Upadhyay et al., 2010), India for the treatment of various ailments.

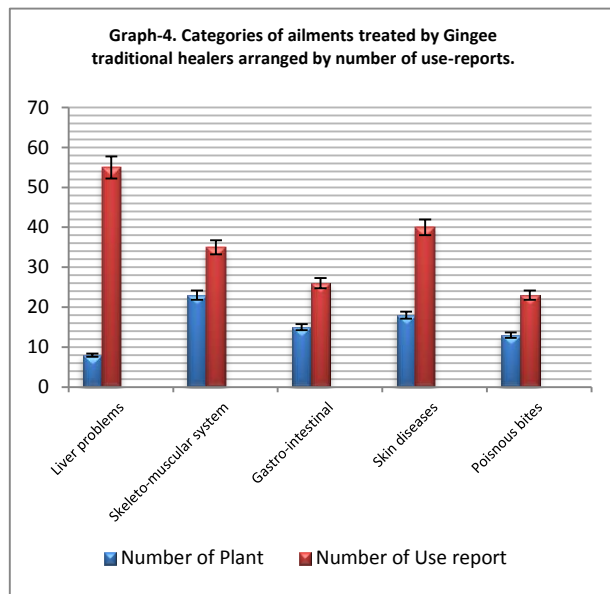
### Informant consensus factor

Generally Fic of local knowledge for disease treatment depended on the availability of the plant species in the study area (Rajakumar and Shivanna, 2009). In order to use the informant consensus factor (Fic), we classified the illnesses into broad disease categories. The Fic values in our study are ranged from 0.63 to 0.88. The use categories with more than 24 use-reports were dermatological infections/diseases (55 use-reports, 26 species), gastro-intestinal diseases (47 use-reports, 21 species) and skeleto-muscular system disorders (32 use-reports, 23 species) (Graph-4). In the present study, endocrinal disorders and liver problems had the highest Fic of 0.88 and 0.86 respectively and it is in agreement with the previous studies among the neighboring indigenous communities in Tamil Nadu, India; diabetes and jaundice had the highest Fic of 1.00 among the Irulas in Thanjavur district (Ragupathy and Newmaster, 2009), jaundice has the highest Fic of 0.92 among the Malasar tribals in Coimbatore district (Ragupathy et al., 2008) and 0.923 among the Paliyar tribals in Theni district (Pandikumar et al., 2011). *Phyllanthus amarus* and *G. sylvestre* were very commonly used for the treatment of jaundice and diabetes correspondingly in these studies.

### Relative importance

The collected medicinal plants possessed number of pharmacological properties (Khare, 2007). The plant with more number of pharmacological properties (PH) was *Moringa oleifera* (20 PH); so, it had a normalized PH value of 1.00 (20/20). *Phyllanthus amarus* was

employed to treat five body systems and had a normalized BS value of 1.00 (5/5). *Abutilon indicum* and *Ocimum sanctum* had the highest RI of 75.0 and it was followed by *Eclipta alpa* (70.0), *Tribulus terrestris* (RI of 67.5), *G. sylvestre* (65.0), *Theprosis purpurea* and *Hibiscus rosa sinensis* (62.5), *Evolvulus nummularius* and *C. viscosa* (57.5). These plants were also used to treat more body systems and were considered as most versatile taxa in the study area. According to Upadhyay et al. (2010).



### CONCLUSION

The present study revealed that traditional medicines were still in common use by the Gingee traditional user communities and accurate knowledge of the plants and their medicinal properties were held by only a few individuals in this community. Hence a need for detailed investigation of ethnobotanical knowledge held by each traditional user community is required before such valuable knowledge vanishes. Thus, our work would be useful in preventing the loss of ethnomedicinal traditions of Gingee traditional user communities. The new claims which are recorded from the study area showed that still much can be learned from investigating herbals available abundantly in the forests. The plants with highest fidelity level and use values in the present study may indicate the possible occurrence of valuable phytochemical compounds and it requires a search for potential new drugs to treat various ailments.



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