



Traditional Medicinal Plants Utilization by Tribal Communities in Kalvarayan Hills of Tamil Nadu: An Analysis Utilization of Medicinal Plants

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ABSTRACT

The present study explores the traditional knowledge and utilization patterns of indigenous medicinal plants among the tribal communities of the Kalvarayan Hills in Tamil Nadu. A total of 120 respondents were selected through proportionate random sampling from seven villages, and data were collected using structured interviews, household surveys, key informant interviews and focus group discussions. Plant specimens were identified using standard floras and expert validation. Analysis using percentage analysis and arithmetic mean showed that 58.33% of respondents had a moderate level of medicinal plant utilization, while 20.83% each reported low and high levels. The most frequently used species were *Phyllanthus niruri* (93.33%), *Abutilon indicum* (91.67%) and *Terminalia chebula* (91.67%) all commonly used for liver disorders, digestive issues, respiratory problems and skin diseases. Preparation methods involved decoctions, pastes, juices and powders, with leaves being the most commonly used plant part. Despite continued relevance, intergenerational knowledge transfer is declining due to modernization, reduced forest access and limited documentation. This trend poses risks to cultural heritage and community health security. The study emphasizes the need for systematic documentation, community herbal gardens, sustainable harvesting and scientific validation to strengthen conservation and support equitable benefit-sharing.

Keywords: Ethnomedicine, Indigenous knowledge, Kalvarayan Hills, Medicinal plants, Traditional healthcare

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INTRODUCTION

The Kalvarayan Hills, situated in the Eastern Ghats of northern Tamil Nadu are inhabited by indigenous tribal communities mainly the Malayali tribe who have preserved extensive traditional knowledge of medicinal plants for healthcare and medicinal purposes (Mehrzhad *et al.*, 2022; Bharathi & Kumar, 2023; Huyen *et al.*, 2023; Sakhnenkova *et al.*, 2023). These communities rely largely on locally available flora to treat common ailments and maintain well-being given their remote forested locations and limited access to modern medical services (Shoghi & Kian, 2022; Kartashev *et al.*, 2023; Petronis *et al.*, 2023; Cantile *et al.*, 2024; Natarajan & Rajendran, 2024). This ethnomedicinal knowledge is primarily transmitted orally across generations and constitutes a critical component of their primary healthcare system (Ouafa *et al.*, 2022; Dkhar & Raghuprasad, 2024).

Globally and in India, traditional medicinal plants play a vital role in supporting community health, especially among marginalized populations with limited access to healthcare. Studies have demonstrated the antimicrobial, anti-inflammatory and hepatoprotective properties of many indigenous plants traditionally used by tribal groups (Viswanathan *et al.*, 2001; Kumar & Lakshmi, 2020; Das *et al.*, 2021; Naik & Panda, 2023; Ghosh *et al.*, 2024). For example, *Phyllanthus niruri*, widely used for liver disorders, has shown

significant chemo-preventive effects in experimental studies (Viswanathan *et al.*, 2001), while *Abutilon indicum* and *Terminalia chebula* are well recognized for their anti-inflammatory and digestive benefits, aligning folk and classical Ayurvedic practices (Siddiqi *et al.*, 2022; Kumar *et al.*, 2025). Despite the significance of ethnomedicine, key challenges threaten its survival, including rapid environmental degradation, deforestation, migration of youth to urban centres, increasing reliance on allopathic treatments and diminishing intergenerational transmission of traditional knowledge (Dagar & Upadhyay, 2022; Ghosh *et al.*, 2024). These challenges contribute to the gradual erosion of a valuable cultural and healthcare resource.

In the Kalvarayan Hills, however, there remains a lack of comprehensive scientific documentation on the specific patterns of medicinal plant use and associated knowledge dynamics among tribal communities. This gap constrains efforts in biodiversity conservation and the sustainable integration of traditional medicine into rural health frameworks (Naik & Panda, 2023). Thus, systematic documentation is essential for preserving cultural heritage, supporting community health security and guiding policy initiatives.

The present study was carried out to document the indigenous medicinal plants used by tribal communities in the Kalvarayan Hills, to evaluate the extent and pattern of their utilization and to explore the socio-cultural and environmental factors influencing knowledge continuity. The specific objectives are: (1) to identify and catalogue the medicinal plant species and their ethnobotanical uses, (2) to quantify utilization levels

among different demographic groups and (3) to assess challenges affecting traditional knowledge transmission. These findings aim to inform conservation strategies, sustainable harvesting practices and the integration of traditional ethnomedical knowledge into public health policy.

MATERIALS AND METHODS

Survey area

The Kalvarayan hill region lies within the Eastern Ghats and spans rugged, forested terrain conducive to the growth of

diverse medicinal plants. Seven tribal villages - Vellimalai, Thodaripattu, Arampondi, Vengodu, Vangikuli, Serapattu and Pottiyam - were selected based on high tribal population density and accessibility during field visits. The geographical location of the study area is presented in **Figure 1**, which shows the position of Kallakurichi District within Tamil Nadu (**Figure 1a**) and the specific location of the Kalvarayan Hills within the Kallakurichi district (**Figure 1b**). This figure provides a visual representation of the study villages and helps contextualize the spatial setting of the research area.

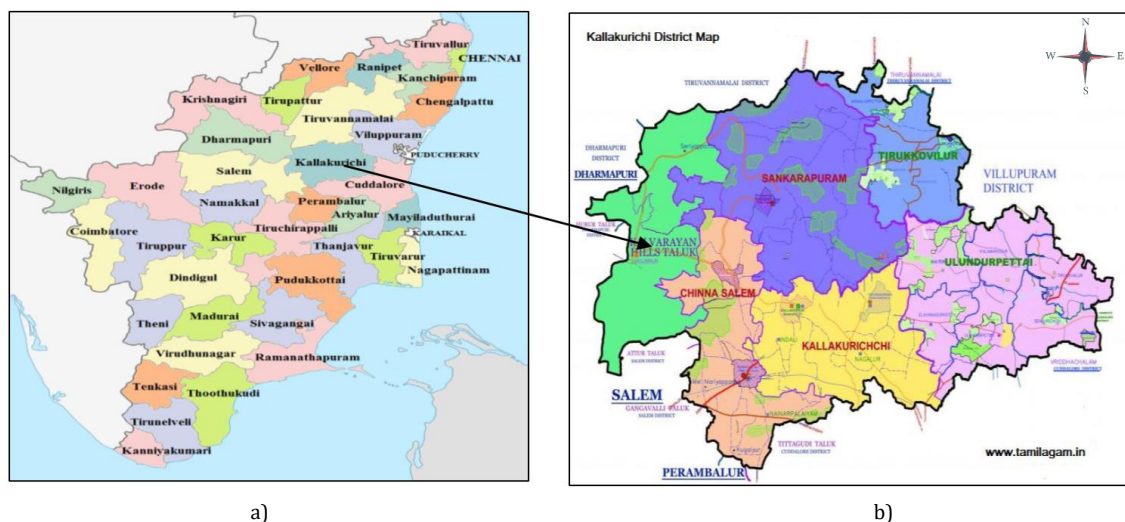


Figure 1. a). Location of Kallakurichi District in the Tamil Nadu map. b). Location of Kalvarayan hills in the Kallakurichi District map.
Source: <https://kallakurichi.nic.in/about-district/district-map/>

Source and nature of material

The primary material consisted of indigenous medicinal plants identified through direct interaction with tribal farmers and traditional healers. Information collected included local names (Tamil), botanical names, parts used (leaf, root, bark, etc.), preparation methods (decoction, paste, juice), dosage, frequency, duration and specific ailments treated. Plant specimens were cross-verified using standard floras (Matthew, 1983) and authenticated herbarium references available at the Department of Botany, Annamalai University.

Selection of samples

The Kalvarayan Hills comprise 18 revenue tribal villages with a total population of 56,327 of which 45,176 belong to Scheduled Tribes (Census of India, 2011). From these, seven villages were purposively selected based on higher tribal concentration and representation. A proportionate random sampling method was employed to ensure demographic representativeness. With a 95% confidence level and 5% margin of error, a total of 120 respondents were selected as a sample.

Data collection techniques

Field data were collected between January and March 2025 using multiple participatory tools:

- **Structured interview schedule:** Administered to all 120 respondents covering family background, health-seeking behaviour, plant usage and knowledge transmission.
- **Key informant interviews (KII):** Conducted with 15

recognized traditional healers and elders to gather detailed information on rare or complex formulations.

- **Focus group discussions (FGD):** Held in each village to validate findings and discuss collective experiences regarding plant availability and changing trends.

All interviews were conducted in Tamil recorded with permission and later transcribed and translated into English.

Statistical analysis

Collected data were analysed using descriptive statistics: percentage analysis, cumulative frequency and arithmetic mean to evaluate the prevalence and intensity of medicinal plant use. Statistical interpretation focused on categorizing utilization levels (low, medium, high) and identifying the most frequently cited species.

RESULTS AND DISCUSSION

Utilization level of medicinal plants

As shown in **Table 1**, the overall utilization of medicinal plants indicates that the majority of the respondents (58.33%) had moderate use, suggesting a transitional phase in which traditional and modern healthcare systems coexist. Only 20.83% reported high utilization, typically among older individuals and traditional healers, while another 20.83% reported low use, mainly youth and those with regular access to government clinics.

Table 1. Distribution of respondents by level of utilization (n=120)

S/N	Category	Number of Respondents	Percent
1	Low	25	20.83
2	Medium	70	58.33
3	High	25	20.83

This shift reflects broader socio-cultural changes, including increased education, exposure to media and improved access to primary health centres. Similar trends have been observed in other tribal regions of India (Guo et al., 2022; Singh & Deshmukh, 2022; Khalil, 2023).

Practice-wise utilization of medicinal plants by tribal communities of kalvarayan hills

A total of 18 medicinal plants documented across various ailment categories are presented in **Table 2**, while representative medicinal plant species are illustrated in **Figure 3a-3f**.

Table 2. Practice-wise utilization of medicinal plants (n=120)

S/N	Local Name	Common/English Name	Scientific Name	Therapeutic Uses	% of Respondents
1	Kizharnelli	Phyllanthus	<i>Phyllanthus niruri</i>	Liver disorders, jaundice	93.33
2	Thuthi	Country Mallow	<i>Abutilon indicum</i>	Liver disorders, anti-inflammatory, digestive	91.67
3	Arugampul	Bermuda Grass	<i>Cynodon dactylon</i>	Digestive ailments	50.00
4	Nilavembu	King of Bitters	<i>Andrographis paniculata</i>	Digestive ailments	48.33
5	Seenthil Kodi	Guduchi	<i>Tinospora cordifolia</i>	Immunity booster	37.50
6	Siriyangai	Green Chirayta	<i>Justicia adhatoda</i>	Respiratory conditions	45.83
7	Vettiver	Vetiver	<i>Vetiveria zizanioides</i>	Skin diseases	49.17
8	Kodi Avarai	Butterfly Pea	<i>Clitoria ternatea</i>	Memory enhancement, anti-stress	50.00
9	Mudakathan	Balloon Vine	<i>Cardiospermum halicacabum</i>	Joint pain, rheumatism	51.66
10	Thoothuvala	Leucas	<i>Solanum trilobatum</i>	Respiratory conditions	84.17
11	Karunthulasi	Black Tulsi	<i>Ocimum tenuiflorum</i>	Respiratory conditions	73.33
12	Kadukkai	Chebulic Myrobalan	<i>Terminalia chebula</i>	Digestive ailments	91.67
13	Aavarai	Field bean	<i>Lablab purpureus</i>	Skin disorders, diabetes	82.50
14	Visha Karappan	Oduvanthalai	<i>Cleistanthus collinus</i>	Skin diseases (used cautiously)	41.67
15	Nannari	Indian Sarsaparilla	<i>Hemidesmus indicus</i>	Blood purifier, fever	67.50
16	Sirukurinjan	Gymnema	<i>Gymnema sylvestre</i>	Diabetes management	55.00
17	Kuppaimeni	Indian Acalypha	<i>Acalypha indica</i>	Skin diseases, wound healing	82.50
18	Adathodai	Vasaka	<i>Justicia adhatoda</i>	Respiratory conditions	61.67

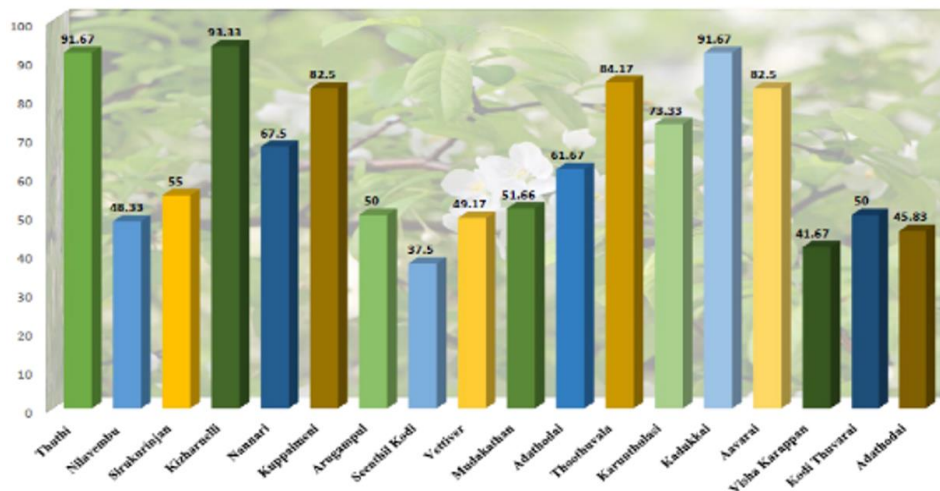


Figure 2. Percentage of respondents utilizing selected medicinal plants for healthcare in the Kalvarayan Hills (highlighting the dominance of *Phyllanthus niruri*, *Abutilon indicum* and *Terminalia chebula* in local healthcare practices)

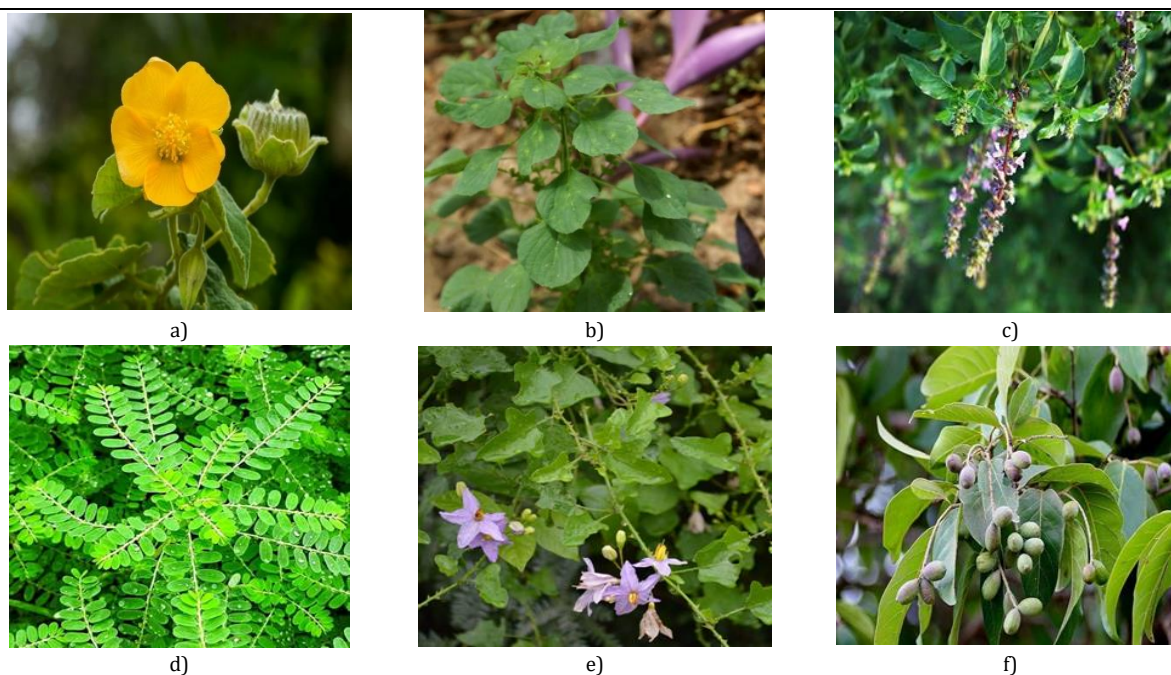


Figure 3. Representative medicinal plants used by tribal communities of the Kalvarayan Hills. a) *Abutilon indicum*. b) *Acalypha indica*. c) *Ocimum tenuiflorum*. d) *Phyllanthus niruri*. e) *Solanum trilobatum*. f) *Terminalia chebula*

The percentage distribution of respondents utilizing selected medicinal plants is presented in **Figure 2**. "*Phyllanthus niruri* (Kizharnelli) was the most frequently used plant (93.33%), primarily for treating jaundice and liver disorders—a finding consistent with its known hepatoprotective activity (Singh *et al.*, 2023; Joshi *et al.*, 2025). Its widespread use underscores community trust in time-tested remedies. *Abutilon indicum* and *Terminalia chebula* were similarly valued for anti-inflammatory, antimicrobial and digestive properties. These species are also integral to Ayurvedic formulations, suggesting overlap between folk and classical systems (Dagar & Upadhyay, 2022; Kumar *et al.*, 2025). Plants like *Leucas aspera* and *Ocimum tenuiflorum* are cultivated near homes, enhancing accessibility and reinforcing domestic healthcare practices. In contrast, climbing or less abundant species such as *Tinospora cordifolia* had lower citation rates (37.50%), likely due to scarcity and difficulty of collection. Some toxic plants, such as *Cleistanthus collinus* ("Visha Karappan"), were used cautiously under expert supervision for skin diseases, highlighting the nuanced understanding held by traditional practitioners (Gandhale & Tekale, 2021; Kaviya *et al.*, 2024).

Challenges to knowledge transmission

Interviews revealed that fewer than 30% of younger respondents could name more than five medicinal plants or describe their uses. Elders expressed concern about the erosion of knowledge, attributing it to:

- Migration of youth to cities for employment
- Lack of formal recognition or incentives for traditional healers
- Decline in forest cover and overharvesting
- Preference for quick-fix allopathic treatments

These observations echo concerns raised in similar studies

across India (Dagar & Upadhyay, 2022).

CONCLUSION

The tribal communities of the Kalrayan Hills continue to depend on indigenous medicinal plants as an essential component of their healthcare practices. The findings highlight the close connection between traditional wisdom and biodiversity conservation, as reflected in the frequent use of medicinal plants such as *Phyllanthus niruri*, *Abutilon indicum* and *Terminalia chebula* by the tribal communities. These species are highly valued for their rich bioactive compounds and for their easy accessibility near homes or in nearby forests, reinforcing a self-sufficient healthcare system. However, the reported decline in the use of some species such as *Justicia adhatoda*, *Alternanthera sessilis* and *Tinospora cordifolia* is a serious concern mainly due to habitat loss and generational shifts. Younger generations increasingly rely on modern healthcare systems leading to a gradual erosion of ethnobotanical knowledge. This trend poses a threat to the sustainability of traditional medicine and the biological-ecological balance of the region. Therefore, urgent efforts are needed to document and preserve indigenous plant knowledge which can contribute significantly to biodiversity conservation and public health policy.

To safeguard this valuable knowledge

1. Documentation efforts should be expanded and shared with local communities in vernacular formats.
2. Community herbal gardens should be promoted to ensure sustainable access.
3. Intergenerational knowledge transfer programs involving schools and local healers must be initiated.
4. Scientific validation of commonly used plants can facilitate integration into national health policies and prevent biopiracy.

Preserving ethnomedical wisdom is not merely about protecting biodiversity-it is about upholding cultural sovereignty and ensuring equitable, resilient healthcare for marginalized populations.

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CONFLICT OF INTEREST: None

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ETHICS STATEMENT: Verbal informed consent was obtained from all participants after explaining the purpose, procedures, benefits and risks of the study. Participants were assured of confidentiality and the right to withdraw at any time.

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