**Original Research Article**

**Ethno-Botanical survey of tree species of scarce rainfall zone of State Andhra Pradesh, India**

**ABSTRACT**

The scarce rainfall zone of Andhra Pradesh is home to a diverse range of tree species with significant ecological, medicinal, and economic value. This study presents an ethno-botanical survey conducted during the year 2022-23in the Anantapur (A.D.), Kurnool (K.D.), Nandyal (N.D.), and Sri Satya Sai (S.D.) districts of Andhra Pradesh, India. A total of 34, 53, 56, and 50 tree species belonging to 16, 21, 22, and 22 different families were recorded in A.D., K.D., N.D., and S.D., respectively. The study highlights the traditional knowledge associated with these species, particularly their medicinal applications. Several tree species recorded in the survey are extensively used in traditional medicine, such as Azadirachta indica (Neem) for its antibacterial and anti-inflammatory properties, Terminalia arjuna for cardiovascular health, Tinospora cordifolia as an immune booster, and Phyllanthus emblica (Amla) as a rich source of vitamin C. Other species like Moringa oleifera are known for their high nutritional and medicinal value, while Albizia lebbeck is used for respiratory ailments. The findings emphasize the importance of conserving these tree species and the indigenous knowledge associated with them for sustainable utilization and future research in phytotherapy.

*Keywords:*Ethno-Botany,phytotherapy, rainfall zone , Moringa oleifera

**Introduction**

Medicinal plants, whether cultivated or wild, contain bioactive compounds that are essential for alleviating pain, managing ailments, and treating various diseases. Throughout history, these plants have been integral to human health and have served as primary remedies for numerous conditions (Kumar *et al.,* 2022). Even today, they remain a crucial component of alternative medicine and continue to contribute to modern drug development by providing key chemical compounds for pharmaceutical synthesis. Despite advancements in conventional medicine, medicinal plants remain the primary source of healthcare for many local communities due to their affordability, accessibility, ease of use, and comparatively lower risk of side effects (Mishra *et al.,* 2022). Globally, medicinal plants play a vital role in healthcare systems, with estimates suggesting that between 50,000 and 80,000 plant species are utilized for medicinal purposes, supporting nearly 80% of the world’s population. The World Health Organization (WHO) reports that over 3.5 billion people, particularly in developing nations, depend on plant-based medicines for their primary healthcare needs (Pandey & Kumar, 2018). Beyond their therapeutic properties, medicinal plants also hold significant economic value, serving as export commodities and providing sustainable income opportunities for indigenous and rural communities (Harasreeramulu 1980; Hemadri *et al.,* 1987). Scarce rainfall zone is prone to recurrent droughts, erratic monsoon patterns, and water scarcity, leading to significant challenges in agricultural production, water conservation and food security (Reddy et al., 1996; Pallewatta, 2020). Despite the harsh environmental conditions, the indigenous communities in this region, including local farmers, tribals, and rural populations, have developed a profound knowledge of the local flora and its uses (Dey *et al.,* 2020). The resilience of these communities, particularly in utilizing drought-resistant plant species, highlights the remarkable adaptability of traditional knowledge systems in managing scarce water resources (Madhusudhan *et al.,* 2021). Knowledge of plant utilization, with a particular focus on species adapted to drought conditions and the role of such plants in ensuring community resilience to environmental stress (Krishna *et al.,* 2020). There is also immense cultural significance of the study of plant biodiversity and their sustainable management (Naqvi *et al.,* 2022). The ethnobotanical practices of this region have been historically shaped by the challenges of limited water availability and the dependence. Consequently, plant species with drought-tolerant and water-storing properties are of particular importance. Furthermore, these species play a crucial role in medicinal practices (Khesoh & Kumar, 2017). The scarce rainfall zone of Andhra Pradesh is characterized by arid and semi-arid climatic conditions, yet it supports a diverse range of tree species with significant ethnobotanical value (Ellis, 1968). Local communities have long relied on these trees for medicinal, economic, and ecological purposes, utilizing various plant parts such as bark, leaves, roots, and seeds for traditional healthcare, agriculture, and commercial applications (Vedavathi, & Mrudula 1996; Jeevanram & Venkataraju 2001). This study aims to document the ethnobotanical knowledge associated with tree species in the Anantapur, Kurnool, Nandyal, and Sri Satya Sai districts, highlighting their medicinal importance and sustainable utilization (Reddy *et al,* 1996; Aruneekumar and Niteswar, 1990). Present studies emphasize the importance of conserving these tree species and the indigenous knowledge associated with them for sustainable utilization and future research in phytotherapy.

**Materials & Methodology**

**Study area**

The research was conducted in the drought-prone region of Andhra Pradesh, India (Fig. 1). Located at an altitude of 269 meters above sea level, the state lies at 16.51° North latitude and 80.52° East longitude, bordered by the states of Karnataka, Telangana, Tamil Nadu, and Odisha. Andhra Pradesh consists of two main areas: the Coastal Plain and Eastern Ghats, as well as the Rayalaseema plateau. The focus of this study was on the Rayalaseema region, specifically within the scarce rainfall zone, which includes the districts of Anantapur, Kurnool, Nandyal, and Sri Sathya Sai.

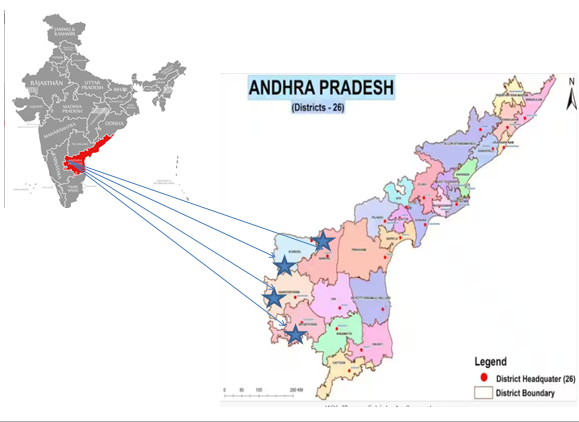


Figure 1: Map of the study areas of State Andhra Pradesh

## Sampling and data collection

Prior to the commencement of fieldwork, informed consent was obtained at various administrative levels, including district, village, community, and individual participants, while necessary permits for plant collection were secured from the relevant authorities. After obtaining consent, were conducted over multiple field visits. These visits aimed to document traditional knowledge related to tree species, their utilization, and cultural significance within the scarce rainfall zone of Andhra Pradesh. Field surveys covered diverse sites across different environmental conditions, allowing for a comprehensive understanding of species distribution and community interactions. Respondents included traditional healers, plant collectors, farmers, traders, and elderly villagers, who provided insights through structured interviews conducted in the local language with the assistance of native speakers. Discussions were guided by checklists with participant engagement, were systematically recorded for further verification and documentation. To ensure participatory validation, specimens collected during the day were reviewed and discussed in the evenings with community members. Additional informal meetings were held in communal settings, such as tea gatherings, to capture insights on species that were declining or newly introduced into local ethno botanical practices. The collected plant specimens were identified using established herbarium records, botanical literature, and ethno taxonomic references. Identification was conducted at recognized botanical institutions, and local vernacular names were documented to preserve indigenous terminologies. Historical herbarium records were also examined to analyze changes in species distribution over time, contributing to a broader understanding of ecosystem dynamics and ethno botanical transitions.

**Result and Discussion**

The Ethnobotanical survey was conducted in the scarce rainfall zone of Andhra Pradesh comprise of four study sites namely Anantapur Dist, Kurnool Dist, Nandyal Dist & Sri Satya Sai Dist. The various 193 tree species which belong to the different families were described. In case of site-1 , of the 34 recorded tree species, the dominant is Fabaceae family with 10 tree species followed by Combretaceae (4), Anacardiaceae (2) and rest were <2. Similarly in the site-2, out of 53 recorded tree species Fabaceae with 18 species Combretaceae (4), Rubiaceae (3), Anacardiaceae (3), Lecythidaceae, Malyaceae, Arecaceae, Myrtaceae and Moraceae (2) while others were <2. In site-3 out of 56 recorded tree species, Fabaceae (18), followed by Rubiaceae and Combretaceae (7), Anacardiaceae (3), and others were <2. In site-4, out of 50 tree species the Fabaceae are (10), Rubiaceae (5), Anacardiaceae (3) and others were <2.The part of tree used and their utilization in different beneficial ways for mankind are described in (Table 1, 2, 3 & 4).

The ethnobotanical survey of tree species in the scarce rainfall zone of Andhra Pradesh revealed a diverse assemblage of medicinally significant taxa with extensive applications in traditional healthcare systems. Several species, including *Azadirachta indica*, *Moringa oleifera*, and *Terminalia arjuna*, exhibit well-documented pharmacological properties such as antibacterial, antifungal, anti-inflammatory, and cardioprotective activities. *Phyllanthus emblica* is recognized for its high antioxidant content and immunomodulatory potential, while *Saraca asoca* has been traditionally utilized for its gynecological benefits. Species such as *Acacia chundra*, *Albizia lebbeck*, and *Butea monosperma* possess bioactive compounds in their bark and roots that are employed in the treatment of dermatological conditions, febrile illnesses, and gastrointestinal disorders. Furthermore, *Pongamia pinnata* demonstrates both medicinal and industrial relevance, particularly in biofuel production and soil amelioration. Nutritionally important species like *Mangifera indica* and *Borassus flabelliformis* contribute to food security and agroforestry sustainability. Beyond their therapeutic applications, many of these species serve critical ecological and economic roles, including timber production, fodder supply, and cultural practices. The predominance of the Fabaceae family in the surveyed region underscores its significance in traditional phytotherapy and agroecological systems. The findings highlight the urgent need for conservation strategies to safeguard these medicinal tree species, ensuring the preservation of indigenous ethnobotanical knowledge and promoting sustainable utilization for future pharmacological advancements. Similar findings were also reported by Penchala *et al.,* (2018), Mishra *et al.,* 2022, and Pandey *et al.,* 2017.

**Table 1: Ethno botanical Survey of Tree Species and their importance in Anantapur Dist. (Site 1)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Tree species** | **Family** | **Part used** | **Utilization** |
|  | *Acacia chundra* | Fabaceae | Wood, Bark and Root | Medicinal, Construction, Agriculture & Commercial |
|  | *Acacia nilotica* | Fabaceae | Wood, Leaves & Gum | Medicinal, Agriculture, Construction & Commercial |
|  | *Albizia amara* | Fabaceae | Bark, Leaves, Wood & Roots | Medicinal, Cultural, Crafts & Animal feed |
|  | *Albizia julibrissin* | Fabaceae | Flowers, Leaves, Bark & Seeds | Medicinal, Cultural & Fodder |
|  | *Albizia lebback* | Fabaceae | Stem, Bark & Root | Medicinal |
|  | *Anogeissus latifolia* | Combretaceae | Bark, Leaves, Wood & Resin | Cultural, Commercial & Medicinal |
|  | *Azadirachta indica* | Meliaceae | Wood, Fruit, Leaves | Fuel wood, Insecticides, Medicinal, Commercial & Agricultural |
|  | *Barringtonia racemosa* | Lecythidaceae | Fruit, Flower, Seed, Bark & Leaves | Medicinal, Cultural & Construction |
|  | *Bombax ceiba* | Malvaceae | Wood, Seed, Bark, Leaves, Flower bud | Fodder, Fiber, Commercial, Vegetable, Silk cotton, gum, Medicinal |
|  | *Borassus flabelliformis* | Arecaceae | Fruit, Sap, Leaves, Bark, Wood, Leaves & Roots | Agricultural, Medicinal, Construction, Crafts, Cultural & Consumption |
|  | *Butea monosperma* | Fabaceae | Resin | Medicinal |
|  | *Careya arborea* | Lecythidaceae | Fruit, Leaves, Bar & Wood | Economical, Medicinal, Fencing, Cultural & Landscaping |
|  | *Casearia elliptica* | Flacourtiaceae | Fruit, Leaves, Bark, Roots & Wood | Medicinal, Cultural, Ecological & Construction |
|  | *Cassia fistula* | Fabaceae | Bark, Roots, Leaves, Flowers, Fruits, Pulp, Seeds & Pods | Traditional, Culinary, Environmental, Cultural & Landscaping |
|  | *Chloroxylon swietenia* | Rutaceae | Leaves, Stem, Resin & Seed | Construction, Medicinal, Crafts, Environmental, Cultural & Medicinal |
|  | *Cochlospermum religiosum* | Bixaceae | Resin, flower, bark, leaves & Seed | Medicinal & Industrial |
|  | *Cordia dichotoma* | Boraginaceae | Fruit, Bark, Leaves & seeds | Medicinal, Food & Edible |
|  | *Dalbergia latifolia* | Fabaceae | Root | Medicinal |
|  | *Ficus bengalensis* | Moraceae | Leaves, Bark, Fruit, Roots | Medicinal, Fodder, Timber, Cultural |
|  | *Ficus hispida* | Moraceae | Leaves, Fruit, Bark | Medicinal, Edible, Fodder, Cultural |
|  | *Ficus religiosa* | Moraceae | Leaves, Bark, Roots, Fruit | Medicinal, Cultural, Religious, Fodder, Timber |
|  | *Lannea coromandelica* | Anacardiaceae | Leaves | Medicinal |
|  | *Mangifera indica* | Anacardiaceae | Fruit, Flower, Wood | Medicinal, Fruit edible, Commercial |
|  | *Moringa oleifera* | Moringaceae | Leaves, Pods, Seeds, Flowers, Bark & Root | Medicinal, Nutritional (Edible), Agricultural, Oil (from seeds), Water purification, Cosmetics |
|  | *Phyllanthus emblica* | Phyllanthaceae | Fruit, leaves bark | Medicinal, Edible Fruit, Fodder |
|  | *Pongamia pinnata* | Fabaceae | Seeds, Oil, Leaves, Flowers, Bark | Medicinal, Fuelwood, Oil (biofuel), Fodder, Soil reclamation, |
|  | *Saraca asoca* | Fabaceae | Bark, flower, leaves & root | Medicinal, Cosmetics, Cultural & Religious |
|  | *Siamese cassia* | Fabaceae | Leaves, Bark & Seeds | Medicinal, Ornamental |
|  | *Tamarindus indica* | Fabaceae | Fruit, Leaves, Bark, Seeds, | Medicinal, Commercial, Fodder, Timber |
|  | *Terminalia alata* | Combretaceae | Timber, Leaves | Commercial |
|  | *Terminalia arjuna* | Combretaceae | Bark | Medicinal |
|  | *Terminalia chebula* | Combretaceae | Leaves, Fruits & Bark | Medicinal, Livestock & Commercial |
|  | *Wrightia tinctoria* | Apocynaceae | Bark, Leaves | Medicinal, |
|  | *Ziziphus xylopyrus* | Rhamnaceae | Leaves, Fruit | Fodder, Fruit edible, Commercial Fuel wood |

**Table 2: Ethno botanical Survey of Tree Species and their importance in Kurnool District (Site 2)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Tree species** | **Family** | **Part used** | **Utilization** |
|  | *Acacia chundra* | Fabaceae | Wood, Bark and Root | Medicinal, Construction, Agriculture & Commercial |
|  | *Acacia leucophloea* | Fabaceae | Bark, Leaves, Seeds & Wood | Medicinal, Cultural, Agriculture & Commercial |
|  | *Acacia nilotica* | Fabaceae | Wood, Leaves & Gum | Medicinal, Agriculture, Construction & Commercial |
|  | *Adina cordifolia* | Rubiaceae | Roots, Leaves, Rhizome & Bark | Medicinal and fodder |
|  | *Aegle marmelos* | Rubiaceae | Fruit, Leave, Wood | Fodder, Fruit edible, Commercial & |
|  | *Alangium salvifolium* | Alangiaceae | Bark, Leaves & Wood | Medicinal, Cultural, Commercial |
|  | *Albizia amara* | Fabaceae | Bark, Leaves, Wood & Roots | Medicinal, Cultural, Crafts & Animal feed |
|  | *Albizia julibrissin* | Fabaceae | Flowers, Leaves, Bark & Seeds | Medicinal, Cultural & Fodder |
|  | *Albizia lebback* | Fabaceae | Stem, Bark & Root | Medicinal & fodder |
|  | *Anacardium occidentale* | Anacardiaceae | Nut, Fruit, Shells, Leaves, Bark & Roots | Medicinal, Cultural & Agricultural |
|  | *Anogeissus latifolia* | Anacardiaceae | Bark, Leaves, Wood & Resin | Cultural, Commercial & Medicinal |
|  | *Azadirachta indica* | Meliaceae | Wood, Fruit, Leaves | Fodder, Fuelwood, Insecticides, Medicinal, Commercial & Agricultural |
|  | *Barringtonia racemosa* | Lecythidaceae | Fruit, Flower, Seed, Bark & Leaves | Medicinal, Cultural & Construction |
|  | *Bombax ceiba* | Malvaceae | Wood, Seed, Bark, Leaves, Flower bud | Fodder, Fiber, Commercial, Vegetable, Silk cotton, gum, Medicinal |
|  | *Borassus flabelliformis* | Arecaceae | Fruit, Sap, Leaves, Bark, Wood, Leaves & Roots | Agricultural, Medicinal, Construction, Crafts, Cultural & Consumption |
|  | *Boswellia serrata* | Arecaceae | Resin, Bark, Leaves, Wood & Root | Medicinal, Aromatic, Construction, Crafts Cultural, Environmental & Economical |
|  | *Careya arborea* | Lecythidaceae | Fruit, Leaves, Bar & Wood | Economical, Medicinal, Fencing, Cultural & Landscaping |
|  | *Casearia elliptica* | Flacourtiaceae | Fruit, Leaves, Bark, Roots & Wood | Medicinal, Cultural, Ecological & Construction |
|  | *Cassia fistula* | Fabaceae | Bark, Roots, Leaves, Flowers, Fruits, Pulp, Seeds & Pods | Traditional, Culinary, Environmental, Cultural & Landscaping |
|  | *Chloroxylon swietenia* | Rutaceae | Leaves, Stem, Resin & Seed | Construction, Medicinal, Crafts, Environmental, Cultural & Medicinal |
|  | *Citrus aurantium* | Rutaceae | Fruit, Peel & Flower | Medicinal, Cosmetics & Food Industries |
|  | *Cordia dichotoma* | Boraginaceae | Fruit, Bark, Leaves & seeds | Medicinal, Food & Edible |
|  | *Dalbergia latifolia* | Fabaceae | Root | Medicinal & fodder |
|  | *Delonix regia* | Fabaceae | Flower, Seed | Ornamental flower, Gum, Food Industries |
|  | *Diospyros melanoxylon* | Ebenaceae | Leaf, fruit, wood & bark | Medicinal & Construction |
|  | *Eucalyptus* | Myrtaceae | Leaf, bark & wood | Medicinal, Cultural & Traditional |
|  | *Ficus bengalensis* | Moraceae | Leaves, Bark, Fruit, Roots | Medicinal, Fodder, Timber, Cultural |
|  | *Ficus religiosa* | Moraceae | Leaves, Bark, Roots, Fruit | Medicinal, Cultural, Religious, Fodder, Timber |
|  | *Gardenia gummifera* | Rubiaceae | Leaf, bark, fruit & flower | Medicinal, cultural & cosmetics |
|  | *Grewia rotundifolia* | Malvaceae | Leaf, bark, fruit & wood | Medicinal, Cultural & Construction |
|  | *Gyrocarpus asiaticus* | Hippocastanaceae | Wood, & bark | Medicinal, Cultural & Construction |
|  | *Hardwickia binata* | Fabaceae | Wood, Bark & leaf | Medicinal, cultural & ornamental |
|  | *Lannea coromandelica* | Anacardiaceae | Leaf, bark, Resin & wood | Medicinal & Construction |
|  | *Mangifera indica* | Anacardiaceae | Fruit, Flower, Wood | Medicinal, Fruit edible, Commercial |
|  | *Moringa oleifera* | Moringaceae | Leaves, Pods, Seeds, Flowers, Bark & Root | Medicinal, Nutritional (Edible), Agricultural, Oil (from seeds), Water purification, Cosmetics |
|  | *Phyllanthus emblica* | Phyllanthaceae | Fruit, leaves bark | Medicinal, Edible Fruit, Fodder |
|  | *Pongamia pinnata* | Fabaceae | Seeds, Oil, Leaves, Flowers, Bark | Medicinal, Fuel wood, Oil (biofuel), Fodder, Soil reclamation, |
|  | *Psidium guajava* | Myrtaceae | Fruit, leaves bark | Medicinal, Fruit edible |
|  | *Pterocarpus marsupim* | Fabaceae | Wood, resin, bark & leaves | Medicinal & Ornamental |
|  | *Pterocarpus santalinus* | Fabaceae | Wood, bark & leaves | Medicinal, Ornamental & Traditional |
|  | *Pterospermum xylocarpum* | Sterculiaceae | Seeds & wood | Medicinal & Construction |
|  | *Saraca asoca* | Fabaceae | Bark, flower, leaves & root | Medicinal, Cosmetics, Cultural & Religious |
|  | *Shorea roxburghii* | Dipterocarpaceae | Wood & resin | Medicinal, Ecological & Construction |
|  | *Siamese cassia* | Fabaceae | Leaves, Bark & Seeds | Medicinal, Ornamental |
|  | *Tamarindus indica* | Fabaceae | Fruit, Leaves, Bark, Seeds, | Medicinal, Commercial, Fodder, Timber |
|  | *Tectona grandis* | Lamiaceae | Lamiaceae | Wood, Leaves, Bark |
|  | *Terminalia arjuna* | Combretaceae | Bark | Medicinal |
|  | *Terminalia bellerica* | Combretaceae | Fruits | Medicinal |
|  | *Terminalia chebula* | Combretaceae | Leaves, Fruits & Bark | Medicinal, Livestock & Commercial |
|  | *Terminalia elliptica* | Combretaceae | Timber | Commercial |
|  | *Wrightia tinctoria* | Apocynaceae | Bark, Leaves | Medicinal, |
|  | *Xylia xylocarpa* | Fabaceae | Seeds, Leaves, Pulp | Timber, Fuelwood, Medicinal, Construction, |
|  | *Ziziphus xylopyrus* | Rhamnaceae | Seeds, Leaves, Pulp | Edible, Medicinal & Ornamental |

**Table 3: Ethno botanical Survey of Tree Species and their importance in Nandyal district (Site 3)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Tree species** | **Family** | **Part used** | **Utilization** |
|  | *Acacia chundra* | Fabaceae | Wood, Bark and Root | Medicinal, Construction, Agriculture & Commercial |
|  | *Acacia leucophloea* | Fabaceae | Bark, Leaves, Seeds & Wood | Medicinal, Cultural, Agriculture & Commercial |
|  | *Acacia nilotica* | Fabaceae | Wood, Leaves & Gum | Medicinal, Agriculture, Construction & Commercial |
|  | *Adina cordifolia* | Rubiaceae | Roots, Leaves, Rhizome & Bark | Medicinal |
|  | *Aegle marmelos* | Rubiaceae | Fruit, Leave, Wood | Fodder, Fruit edible, Commercial & |
|  | *Alangium salvifolium* | Alangiaceae | Bark, Leaves & Wood | Medicinal, Cultural, Commercial |
|  | *Albizia amara* | Fabaceae | Bark, Leaves, Wood & Roots | Medicinal, Cultural, Crafts & Animal feed |
|  | *Albizia julibrissin* | Fabaceae | Flowers, Leaves, Bark & Seeds | Medicinal, Cultural & Fodder |
|  | *Albizia lebback* | Fabaceae | Stem, Bark & Root | Medicinal |
|  | *Anacardium occidentale* | Anacardiaceae | Nut, Fruit, Shells, Leaves, Bark & Roots | Medicinal, Cultural & Agricultural |
|  | *Annona squamosa* | Annonaceae | Fruit, Seed, Leaves, Bark & Root | Agricultural, Medicinal & Cultural |
|  | *Anogeissus latifolia* | Combretaceae | Bark, Leaves, Wood & Resin | Cultural, Commercial & Medicinal |
|  | *Azadirachta indica* | Meliaceae | Wood, Fruit, Leaves | Fodder, Fuelwood, Insecticides, Medicinal, Commercial & Agricultural |
|  | *Bombax ceiba* | Malvaceae | Wood, Seed, Bark, Leaves, Flower bud | Fodder, Fiber, Commercial, Vegetable, Silk cotton, gum, Medicinal |
|  | *Boswellia serrata* | Burseraceae | Resin, Bark, Leaves, Wood & Root | Medicinal, Aromatic, Construction, Crafts Cultural, Environmental & Economical |
|  | *Butea monosperma* | Fabaceae | Resin | Medicinal |
|  | *Cassia fistula* | Fabaceae | Bark, Roots, Leaves, Flowers, Fruits, Pulp, Seeds & Pods | Traditional, Culinary, Environmental, Cultural & Landscaping |
|  | *Chloroxylon swietenia* | Rutaceae | Leaves, Stem, Resin & Seed | Construction, Medicinal, Crafts, Environmental, Cultural & Medicinal |
|  | *Citrus aurantium* | Rutaceae | Fruit, leaf & flower | Medicinal & cosmetics |
|  | *Grewia rotundifolia* | Malvaceae | Leaf, fruit, bark & wood | Medicinal, edible & construction |
|  | *Gyrocarpus asiaticus* | Hippocastanaceae | Wood, seeds & leaf | Construction & medicinal |
|  | *Hardwickia binata* | Fabaceae | Wood, Bark & leaf | Medicinal, cultural & ornamental |
|  | *Holoptelea integrifolia* | Ulmaceae | Bark, leaf, wood & root | Medicinal, cultural & ornamental |
|  | *Hymenodictyon orixense* | Rubiaceae | Bark, leaf & root | Medicinal & cultural |
|  | *Ixora arborea* | Rubiaceae | Flower, leaves bark & Root | Medicinal, Treditional & Ornamental |
|  | *Lagerstroemia parviflora* | Lythraceae | Bark, leaf, flower & wood | Medicinal & construction |
|  | *Lannea coromandelica* | Anacardiaceae | Leaf, bark, Resin & wood | Medicinal & Construction |
|  | *Madhuca longifolia* | Sapotaceae | Flower, fruit, seed & bark | Medicinal, edible & fodder |
|  | *Mangifera indica* | Anacardiaceae | Fruit, Flower, Wood | Medicinal, Fruit edible, Commercial |
|  | *Mimusops elangi* | Sapotaceae | Fruit, wood, bark & leaf | Medicinal & Fruit edible |
|  | *Morinda umbellate* | Rubiaceae | Roots, leaf, fruit & bark | Medicinal |
|  | *Moringa oleifera* | Moringaceae | Leaves, Pods, Seeds, Flowers, Bark & Root | Medicinal, Nutritional (Edible), Agricultural, Oil (from seeds), Water purification, Cosmetics |
|  | *Phyllanthus emblica* | Phyllanthaceae | Fruit, leaves bark | Medicinal, Edible Fruit, Fodder |
|  | *Pongamia pinnata* | Fabaceae | Seeds, Oil, Leaves, Flowers, Bark | Medicinal, Fuelwood, Oil (biofuel), Fodder, Soil reclamation, |
|  | *Psidium guajava* | Myrtaceae | Fruit, leaves bark | Medicinal, Fruit edible |
|  | *Pterocarpus marsupium* | Fabaceae | Wood, resin, bark & leaves | Medicinal & Ornamental |
|  | *Pterocarpus santalinus* | Fabaceae | Wood, bark & leaves | Medicinal, Ornamental & Traditional |
|  | *Pterospermum xylocarpum* | Sterculiaceae | Seeds & wood | Medicinal & Construction |
|  | *Sesbania grandiflora* | Fabaceae | Leaves, flowers, seeds & bark | Medicinal, Agricultural, firewood & Ornamental |
|  | *Shorea roxburghii* | Dipterocarpaceae | Wood, resin & bark | Medicinal & construction |
|  | *Siamese cassia* | Fabaceae | Leaves, Bark & Seeds | Medicinal, Ornamental |
|  | *Strychnos nux-vomica* | Loganiaceae | Seeds | Medicinal |
|  | *Strychnos potatorum* | Loganiaceae | Seeds | Medicinal |
|  | *Tamarindus indica* | Fabaceae | Fruit, Leaves, Bark, Seeds, | Medicinal, Commercial, Fodder, Timber |
|  | *Tectona grandis* | Lamiaceae | Wood, Leaves, Bark | Timber, Medicinal, Furniture, Construction, Pulp, Essential oils |
|  | *Terminalia alata* | Combretaceae | Timber, Leaves | Commercial |
|  | *Terminalia arjuna* | Combretaceae | Bark | Medicinal |
|  | *Terminalia bellerica* | Combretaceae | Fruits | Medicinal |
|  | *Terminalia chebula* | Combretaceae | Leaves, Fruits & Bark | Medicinal, Livestock & Commercial |
|  | *Terminalia elliptica* | Combretaceae | Timber | Commercial |
|  | *Terminalia latifolia* | Combretaceae | Timber, Seeds | Medicinal, Edible Seeds, Commercial |
|  | *Wrightia arborea* | Apocynaceae | Bark, leaf flower & wood | Medicinal & construction |
|  | *Wrightia tinctoria* | Apocynaceae | Bark, Leaves | Medicinal, |
|  | *Xylia xylocarpa* | Fabaceae | Seeds, Leaves, Pulp | Timber, Fuel wood, Medicinal, Construction, |
|  | *Ziziphus mauritiana* | Rhamnaceae | Leaves, Fruit | Fodder, Fruit edible, Commercial Fuel wood |
|  | *Ziziphus xylopyrus* | Rhamnaceae | Seeds, Leaves, Pulp | Edible, Medicinal & Ornamental |

**Table 4: Ethno botanical Survey of Tree Species and their importance in Sri Satya Sai district (Site 4)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Tree species** | **Family** | **Part used** | **Utilization** |
|  | *Aegle marmelos* | Rutaceae | Fruit, Leave, Wood | Fodder, Fruit edible & Commercial |
|  | *Alangium salvifolium* | Alangiaceae | Bark, Leaves & Wood | Medicinal, Cultural, Commercial |
|  | *Albizia amara* | Fabaceae | Bark, Leaves, Wood & Roots | Medicinal, Cultural, Crafts & Animal feed |
|  | *Albizia lebback* | Fabaceae | Stem, Bark & Root | Medicinal |
|  | *Anacardium occidentale* | Anacardiaceae | Nut, Fruit, Shells, Leaves, Bark & Roots | Medicinal, Cultural & Agricultural |
|  | *Annona squamosa* | Annonaceae | Fruit, Seed, Leaves, Bark & Root | Agricultural, Medicinal & Cultural |
|  | *Anogeissus latifolia* | Combretaceae | Bark, Leaves, Wood & Resin | Cultural, Commercial & Medicinal |
|  | *Azadirachta indica* | Meliaceae | Wood, Fruit, Leaves | Fodder, Fuelwood, Insecticides, Medicinal, Commercial & Agricultural |
|  | *Barringtonia racemosa* | Lecythidaceae | Fruit, Flower, Seed, Bark & Leaves | Medicinal, Cultural & Construction |
|  | *Bombax ceiba* | Malvaceae | Wood, Seed, Bark, Leaves, Flower bud | Fodder, Fiber, Commercial, Vegetable, Silk cotton, gum, Medicinal |
|  | *Boswellia serrata* | Burseraceae | Resin, Bark, Leaves, Wood & Root | Medicinal, Aromatic, Construction, Crafts Cultural, Environmental & Economical |
|  | *Butea monosperma* | Fabaceae | Resin | Medicinal |
|  | *Casearia elliptica* | Flacourtiaceae | Fruit, Leaves, Bark, Roots & Wood | Medicinal, Cultural, Ecological & Construction |
|  | *Cassia fistula* | Fabaceae | Bark, Roots, Leaves, Flowers, Fruits, Pulp, Seeds & Pods | Traditional, Culinary, Environmental, Cultural & Landscaping |
|  | *Chloroxylon swietenia* | Rutaceae | Leaves, Stem, Resin & Seed | Construction, Medicinal, Crafts, Environmental, Cultural & Medicinal |
|  | *Citrus aurantium* | Rutaceae | Fruit, leaf & flower | Medicinal |
|  | *Cochlospermum religiosum* | Bixaceae | Resin, flower, bark, leaves & Seed | Medicinal & Industrial |
|  | *Cordia dichotoma* | Boraginaceae | Fruit, wood, leaf & seed | Medicinal & construction |
|  | *Dalbergia latifolia* | Fabaceae | Root | Medicinal |
|  | *Delonix regia* | Fabaceae | Flower, Seed | Ornamental flower, Gum, Food Industries |
|  | *Diospyros chloroxylon* | Ebenaceae | Wood, bark & leaf | Medicinal, ornamental & Crafts |
|  | *Diospyros melanoxylon* | Ebenaceae | Leaf, fruit, wood & bark | Medicinal & Construction |
|  | *Eucalyptus* | Myrtaceae | Leaf, bark & wood | Medicinal, Cultural & Traditional |
|  | *Ficus bengalensis* | Moraceae | Leaves, Bark, Fruit, Roots | Medicinal, Fodder, Timber, Cultural |
|  | *Ficus hipsida* | Moraceae | Leaves, Fruit, Bark | Medicinal, Edible, Fodder, Cultural |
|  | *Ficus religiosa* | Moraceae | Leaves, Bark, Roots, Fruit | Medicinal, Cultural, Religious, Fodder, Timber |
|  | *Gardenia resinifera* | Rubiaceae | Resin | Medicinal & Scientific purpose |
|  | *Gardenia turgida* | Rubiaceae | Root, fruit, Wood & bark | Medicinal & food |
|  | *Grewia rotundifolia* | Malvaceae | Leaf, bark, fruit & wood | Medicinal, Cultural & Construction |
|  | *Hardwickia binata* | Fabaceae | Wood, Bark & leaf | Medicinal, cultural & ornamental |
|  | *Holoptelea integrifolia* | Ulmaceae | Bark, leaf, wood & root | Medicinal, cultural & ornamental |
|  | *Hymenodictyon orixense* | Rubiaceae | Bark, leaf & root | Medicinal & cultural |
|  | *Ixora arborea* | Rubiaceae | Flower, leaves bark & Root | Medicinal, Treditional & Ornamental |
|  | *Mangifera indica* | Anacardiaceae | Fruit, Flower, Wood | Medicinal, Fruit edible, Commercial |
|  | *Phyllanthus emblica* | Phyllanthaceae | Fruit, leaves bark | Medicinal, Edible Fruit, Fodder |
|  | *Psidium guajava* | Myrtaceae | Fruit, leaves bark | Medicinal, Fruit edible |
|  | *Pterocarpus santalinus* | Fabaceae | Wood, bark & leaves | Medicinal, Ornamental & Traditional |
|  | *Pterospermum xylocarpum* | Sterculiaceae | Seeds & wood | Medicinal & Construction |
|  | *Sesbania grandiflora* | Fabaceae | Leaves, flowers, seeds & bark | Medicinal, Agricultural, firewood & Ornamental |
|  | *Strychnos nuxvomica* | Loganiaceae | Fruit, leaves, Bark & Seeds | Medicinal |
|  | *Tamarindus indica* | Fabaceae | Fruit, Leaves, Bark, Seeds | Medicinal, Commercial, Fodder, Timber |
|  | *Tectona grandis* | Lamiaceae | Wood, Leaves, Bark | Timber, Medicinal, Furniture, Construction, Pulp, Essential oils |
|  | *Terminalia alata* | Combretaceae | Timber, Leaves | Commercial |
|  | *Terminalia arjuna* | Combretaceae | Bark | Medicinal |
|  | *Terminalia elliptica* | Combretaceae | Timber | Commercial |
|  | *Terminalia latifolia* | Combretaceae | Timber, Seeds | Medicinal, Edible Seeds, Commercial |
|  | *Wrightia arborea* | Apocynaceae | Bark, leaf, flower, root & seed | Medicinal, Timber & Ornamental |
|  | *Wrightia tinctoria* | Apocynaceae | Bark, Leaves | Medicinal, |
|  | *Xylia xylocarpa* | Fabaceae | Seeds, Leaves, Pulp | Timber, Fuelwood, Medicinal, Construction, |
|  | *Ziziphus mauritiana* | Rhamnaceae | Leaves, Fruit | Fodder, Fruit edible, Commercial Fuel wood |

The tree species recorded demonstrates a broad spectrum use of medicinal, ornamental, construction and livestock etc, indicating their substantial value in both healthcare and economic sectors. For example, species such as *Azadirachta indica* and *Albizia julibrissin* are particularly valued for their insecticidal properties, medicinal benefits, and agricultural uses. These species not only contribute to the wellbeing of local communities but also play a role in enhancing agricultural practices. Similarly, trees like *Moringa oleifera* and *Phyllanthus emblica* offer significant nutritional benefits alongside their medicinal properties, making them crucial for both health and food security. Addition to their medicinal applications, several of these species serve multiple functions in local economies. *Tamarindus indica* and *Borassus flabelliformis*, for instance, are utilized in various sectors, including food production, fodder supply, and timber, providing diverse economic benefits. Other species, such as *Pongamia pinnata*, contribute to the emerging biofuel industry, emphasizing their ecological and commercial significance.

**Conclusion**

A total of 4 sites were found in the SRZ of A.P, India, A total of 16, 21, 22 and 22 families recorded with 34, 53, 56 and 50 different species in the Anantapur Dist., Kurnool Dist., Nandyal Dist. and Sri Satya Sai Dist. respectively. The tree species examined in this study show a remarkable diversity in the applications, ranging from medicinal to cultural, agricultural, and commercial uses. These multi-faced utilities underline their importance to both traditional practices and modern economies. The ethnobotanical survey conducted in the scarce rainfall zone of Andhra Pradesh underscores the significant medicinal, ecological, and economic value of the region’s tree species. The recorded diversity across Anantapur, Kurnool, Nandyal, and Sri Satya Sai districts highlights the rich traditional knowledge associated with these species, particularly their therapeutic applications in indigenous medicine. Several species, including *Azadirachta indica*, *Terminalia arjuna*, *Tinospora cordifolia*, and *Phyllanthus emblica*, exhibit well-documented pharmacological properties, contributing to the treatment of a wide range of ailments. Additionally, nutritionally and medicinally valuable species such as *Moringa oleifera* and *Albizia lebbeck* play a crucial role in health and food security. Given the increasing reliance on plant-based medicine and the potential for novel drug discoveries, the conservation of these species is imperative. Protecting indigenous knowledge and promoting sustainable utilization through research and conservation strategies will not only enhance biodiversity preservation but also support advancements in phytotherapy and alternative medicine. This study reinforces the need for continued documentation and scientific validation of traditional medicinal practices to ensure their long-term sustainability and integration into modern healthcare systems.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Consent

As per international standards or university standards, Participants’ written consent has been collected and preserved by the author(s

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