



Review Article

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Ethnic Medicinal Plant Wealth of Eastern Ghats: Status, Knowledge Systems and Conservation Strategies

N. Sivaraj^{1*}, S.R. Pandravada¹, Kamala Venkateswaran¹ and N. Dikshit²

¹ICAR-National Bureau of Plant Genetic Resources, Regional Station, Hyderabad 500 030, Telangana, India

²ICAR-National Bureau of Plant Genetic Resources, Regional Station, Akola 444 104, Maharashtra, India

*Corresponding author.

Abstract

The Eastern Ghats stretching from Odisha, Chhattisgarh, through Andhra Pradesh to Tamil Nadu and parts of Karnataka are endowed with a large variety of biological species, geological formations and indigenous tribal groups. The traditional knowledge systems on medicinal plants prevailing in Eastern Ghats of India and suitable management strategies proposed for the conservation of folklore medicinal plant species are reviewed in this article.

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Introduction

Plants are being utilized as medicines for thousands of years all over the globe and are a source of many potent and powerful drugs. Traditional medicine has become more popular in the treatment of many diseases due to popular belief that these are safe, easily available and with fewer side effects. The World Health Organization (WHO) estimated that 80% of the population of developing countries depend on plant drugs for their primary health care needs. Medicinal plants are vital components and play a significant role in the health care of rural people all over the world. There are many traditional systems of medicine associated with their own different philosophies and cultural origins. The herbal medicines/ traditional medicaments have been derived from rich traditions of ancient civilizations and

scientific heritage. The earliest recorded evidence of their use in Indian, Chinese, Egyptian, Greek, Roman and Syrian texts dates back to about 5,000 years. The classical Indian texts including *Rig-Veda*, *Charaka Samhita* and *Shushruta Samhita* are the evidences for these age old traditions (Kamboj, 2000).

Medicinal plants are used in various indigenous systems of medicine such as *Siddha*, *Ayurveda*, *Amchi*, *Unani* and even in Allopathy, with pharmaceutical industries depending on plant products for preparation of the medicines. Herbal drugs or medicinal plants, their extracts and their isolated compounds have demonstrated a wide spectrum of biological activities. Such natural medicines have been used, and continue to be used as medicine or as food supplements for various disorders as described in various texts and folklore.

Safe, effective and inexpensive indigenous remedies are currently gaining popularity among the people of both the urban and rural areas in India. Plant based ethnic and traditional knowledge systems have become a recognized tool in search of drugs and pharmaceuticals. An attempt has been made to review the traditional knowledge systems on medicinal plants prevailing in Eastern Ghats of India and suitable management strategies proposed for the conservation of folklore medicinal plant species.

Eastern Ghats and ethnic diversity

The Eastern Ghats, one of the major hill ranges of India, located between 77°22' and 85°20' E and 11°30' and 21°00' N, form an assembly of discontinuous ranges, hills, plateaus, escarpments, narrow basins and spread in an area of about 75,000 km². The Eastern Ghats stretching from Odisha, Chhattisgarh, through Andhra Pradesh to Tamil Nadu and parts of Karnataka are endowed with a large variety of biological species, geological formations (Krishnan, 1968) and indigenous tribal groups. For Eastern Ghats, the Mahanadi basin marks the northern boundary while the southern boundary lies in the Nilgiri hills. The tips of Bastar, Telangana, Karnataka plateaus and Tamil Nadu uplands form the boundary in the West, while the coastal belt forms the boundary in the East.

The Eastern Ghats region is inhabited by nearly 54 tribal communities, which constitute nearly 30% of total population (Chauhan, 1998). The major tribes in the Eastern Ghats are *Aronghan*, *Irular*, *Kota*, *Kotanayakam*, *Kurmar*, *Puniyan*, *Pulayan*, *Sholaga* and *Tuda*, *Malayali* in the southern region, *Bagata*, *Chenchu*, *Gadaba*, *Jatapu*, *Kammara*, *Kondadora*, *Kondakapu*, *Kondareddy*, *Kandha*, *Kotiobenthuriya*, *Koya/ Goud*, *Kulia*, *Mali*, *Mukadora*, *Mannedora*, *Nayaka*, *Paraja*, *Reddidora*, *Savara*, *Valmiki*, *Yenadi* and *Yerukala* in central region and *Bathudi*, *Birjhal*, *Bhuiyan*, *Dhuma*, *Bhumis*, *Bhuttada*, *Gond*, *Khana*, *Kisan*, *Kolba*, *Munda*, *Oraon*, *Soarha* and *Sounti* in the northern region. The variations in altitude and climatic conditions, especially in rainfall have immensely contributed to the evolution of rich ethnic floristic diversity in the Eastern Ghats. This region is very rich in terms of natural wealth, which is manifested, in its greatest biological diversity. Out of 2,500 species of flowering plants belonging to Angiosperms, Gymnosperms and Pteridophytes known to occur in Eastern Ghats, about 77, species (67 Dicots, 9 Monocots and 1 Gymnosperms) are endemic.

Status of ethnic medicinal plant genetic resources in Eastern Ghats

The rich and diverse heritage of traditional indigenous medicinal and aromatic plants in Eastern Ghats is threatened due to various abiotic and biotic stresses coupled with the technological advancement. With increasing interest in herbal medicines worldwide, conservation of medicinal plants in Eastern Ghats has assumed considerable importance. The Eastern Ghats are endowed with rich floristic diversity consisting of more than 2,000 species of plants including medicinal plant species (1,800) belonging to angiosperms, gymnosperms and pteridophytes. Eastern Ghats vegetation includes 454 endemic species belonging to 243 genera and 78 families (Sudhakar Reddy et al., 2002). At least 788 medicinal plant taxa and 40 aromatic plants are concentrated in this area which are used in various medicinal systems including codified and folklore which belong to 132 families and 384 genera. The dominant medicinal plant families in the Eastern Ghats are Leguminosae (67 spp.), Apocynaceae (29 spp.), Malvaceae (26 spp.), Euphorbiaceae (25 spp.), Orchidaceae (22 spp.), Solanaceae and Rubiaceae (16 spp. each), Asteraceae (15 spp.), Acanthaceae, Asteraceae and Lamiaceae (14 spp. each), Cucurbitaceae and Zingiberaceae (13 spp. each), Rutaceae (12 spp.) and Araceae (10 spp.). These medicinal plant genetic resources are distributed in various vegetation types in the Eastern Ghats region (see Table 1). A total of 560 tree taxa fewer than 262 genera belonging to 80 families are reported to occur in the Eastern Ghats (Sandhya Rani and Pullaiah, 2002). Dye yielding plants occur in the southern most point of Eastern Ghats is recorded by Krishnamurthy et al., 2002. The Eastern Ghats region is being exploited in an unregulated manner for this natural wealth. Several published floras by eminent botanists from the region are available on Eastern Ghats such as H.H. Haines, J.S. Gamble, C.E.C. Fischer, C.A. Barber, C.H. Beddome, T. Spring, J.L. Ellis, K.M. Matthew, R.S. Rao, G. Subba Rao, B. Suryanarayana, T. Pullaiah, H.F. Mooney etc., and changes in plant biodiversity pattern of the region was also a subject of review recently (Pandravada et al., 2004). Genera such as *Anaphalis*, *Bulbophyllum*, *Callicarpa*, *Clematis*, *Debregeasia*, *Delphinium*, *Dillenia*, *Ensete*, *Eulophia*, *Exacum*, *Lobelia*, *Mallotus*, *Meliosma*, *Mucuna*, *Pimpinella*, *Prunus*, *Raphidophora*, *Sapium*, *Saussurea*, *Syzygium*, *Tinospora*, *Vanilla*, *Viburnum* present in the Eastern Ghats are common to the Himalayas, Khasi and Jaintia hills of Meghalaya and the Western Ghats. *Cycas*

beddomei, *Cycas circinalis* and *Gnetum scandens* and about 30 species of ferns including *Cyathea gigantea*- a tree fern, are also distributed in this region. Select

medicinal plant species which are used by the ethnic communities from Eastern Ghats region is documented in Table 2.

Table 1. Predominant medicinal taxa occurring in different vegetation types of Eastern Ghats.

Scrub	Deciduous	Evergreen/ Semi evergreen
<i>Acacia chundra</i>	<i>Adina cordifolia</i>	<i>Arisaema sp.</i>
<i>Albizia amara</i>	<i>Andrographis paniculata</i>	<i>Bridelia tomentosa</i>
<i>Anogeissus latifolia</i>	<i>Bauhinia vahlii</i>	<i>Callicarpa tomentosa</i>
<i>Apluda mutica</i>	<i>Boswellia ovalifoliolata</i>	<i>Calycopteris floribunda</i>
<i>Atalantia monophylla</i>	<i>Bridelia retusa</i>	<i>Celtis cinnamomea</i>
<i>Capparis sepiaria</i>	<i>Careya arborea</i>	<i>Centella asiatica</i>
<i>Carissa spinarum</i>	<i>Cassia fistula</i>	<i>Cinnamomum zeylanicum</i>
<i>Cassia auriculata</i>	<i>Cipadessa baccifera</i>	<i>Coelogyne nervosa</i>
<i>Cissus quadrangularis</i>	<i>Dendrocalamus strictus</i>	<i>Couroupita guianensis</i>
<i>Curculigo orchoides</i>	<i>Garuga pinnata</i>	<i>Dillenia pentagyna</i>
<i>Cymbopogon flexuosum</i>	<i>Grewia tiliifolia</i>	<i>Elaeocarpus serratus</i>
<i>Decalepis hamiltonii</i>	<i>Helicteres isora</i>	<i>Entada pursaetha</i>
<i>Dichrostachys cinerea</i>	<i>Kydia calycina</i>	<i>Ichnocarpus frutescens</i>
<i>Dodonaea viscosa</i>	<i>Madhuca longifolia</i>	<i>Ixora montana</i>
<i>Eclipta alba</i>	<i>Memecylon umbellatum</i>	<i>Macaranga peltata</i>
<i>Embllica officinalis</i>	<i>Mucuna pruriens</i>	<i>Mallotus philippensis</i>
<i>Euphorbia antiquorum</i>	<i>Pterocarpus marsupium</i>	<i>Mangifera indica</i>
<i>Euphorbia tirucalli</i>	<i>Schleichera trijuga</i>	<i>Mesua nagassarium</i>
<i>Hemidesmus indicus</i>	<i>Sterculia urens</i>	<i>Michelia champaca</i>
<i>Holarrhena antidysenterica</i>	<i>Terminalia arjuna</i>	<i>Naravelia zeylanica</i>
<i>Hugonia mystex</i>	<i>Terminalia chebula</i>	<i>Ochna gamblei</i>
<i>Pergularia daemia</i>	<i>Terminalia tomentosa</i>	<i>Pimpinella tirupatiensis</i>
<i>Phyllanthus amarus</i>	<i>Tinospora cordifolia</i>	<i>Plumbago zeylanica</i>
<i>Santalum album</i>	<i>Toddalia asiatica</i>	<i>Rauwolfia serpentina</i>
<i>Strychnos nux-vomica</i>	<i>Woodfordia fruticosa</i>	<i>Toona ciliata</i>
<i>Tridax procumbens</i>	<i>Wrightia tinctoria</i>	<i>Xylia xylocarpa</i>

(Source: Sivaraj et al., 2006)

Traditional knowledge on medicinal plant systems

Ethnobotanical knowledge from the Eastern Ghats region has been recorded by several workers (Saxena and Dutta, 1975; Banerjee, 1977; Reddy, 1980; Rao and Harasreeramulu, 1985; Thammanna and Narayana Rao, 1988; Ravisankar and Henry 1992; Goud and Pullaiah, 1996; Rama Rao and Henry, 1996; Vedavathy et al. 1997; Pandravada and Sivaraj, 1999; Pandravada et al., 2000; Raghava Rao and Subba Reddi 2002; Reddy et al. 2002; Dikshit and Sivaraj, 2014). The tribals living in the Eastern Ghats depend mostly on various forest products but their careless collection resulted in much damage to the forest wealth particularly rare and endangered medicinal plant species. Many tribal communities are practicing their

local health traditional methods using medicinal herbs to cure various ailments. Their understanding of the medicinal flora around them and related indigenous knowledge systems are transmitted through successive generations and practiced as a part of their tradition and culture. Medical practices of local and indigenous people have remained unchanged over long periods of time. In the face of increasing industrialization and modernization, the knowledge base of local health traditions has begun to erode. *Acacia catechu*, *A. concinna*, *Cassia auriculata*, *C.fistula*, *C. javanica*, *C. senna*, *Ceratonia siliqua*, *glycyrrhiza glabra*, *Mucuna pruriens*, *Psoralea corylifolia*, *Pueraria tuberosa* are some of the medicinal legumes and *Caesalpinia*, *Indigofera* are some of the dye yielding plants from Eastern Ghats in India.

Table 2. Select medicinal plant diversity used by ethnic communities of Eastern Ghats.

S.No.	Name of the plant species	Family	Common English name/ Local name	Medicinal property*
1	<i>Abutilon polyandrum</i> (Roxb.) Wight & Arn.	Malvaceae	Persian mallow	Anti-bacterial, antifungal, anti-protozoal, anti-fertility, cardiovascular activity
2	<i>Acacia arabica</i> (Lam.) Willd.	Mimosaceae	Babool tree, Indian Gum arabic	Astringent, antidiarrheal
3	<i>Acacia concinna</i> (Willd.) DC.	Mimosaceae	Soap acacia	Analgesic, spasmolytic
4	<i>Acacia sundra</i> (Roxb.) DC.	Mimosaceae	Catechu	Spasmolytic
5	<i>Acanthospermum hispidum</i> DC.	Asteraceae	Bristly Starbur	Antibacterial, Antifungal, antipyretic
6	<i>Achyranthes aspera</i> L.	Amaranthaceae	Prickly-chaff flower	Antibiotic, Hypoglycaemic
7	<i>Adenostemma lavenia</i> (L.) Kuntze	Amaranthaceae	Sticky Daisy	Diuretic, wounds/injuries
8	<i>Adina cordifolia</i> (Roxb.) Hook.f.ex Brandis	Rubiaceae	Yellow Teak	Antibacterial, febrifuge
9	<i>Aerva lanata</i> (L.) Juss.	Amaranthaceae	Mountain Knot Grass	Diuretic, anthelmintic, antidote for snake-bite
10	<i>Aerva monsoniae</i> (Retz.) C.Martius	Amaranthaceae	NA	Anti-cancerous
11	<i>Aganosma cymosum</i> (Roxb.) Don	Apocynaceae	Sellakkodi	Anthelmintic
12	<i>Ageratum conyzoides</i> L.	Asteraceae	Goat weed	Anti-cancerous; anti-fungal, antibacterial, Insecticidal
13	<i>Aglaia roxburghiana</i> (Wight & Arn.) Miq. var. <i>courtallensis</i> Gamble	Meliaceae	<i>Priyangu</i>	Astringent and cooling
14	<i>Alangium salviifolium</i> (L.f.) Wangerin	Alangiaceae	Sage leaved alangium	Hypoglycaemic and spasmolytic
15	<i>Albizia lebbek</i> (L.) Benth.	Mimosaceae	Siris tree	Anti-cancerous, antiprotozoal
16	<i>Albizia odoratissima</i> (L.f.) Benth.	Mimosaceae	<i>Kala Siris</i>	Diuretic, hypoglycaemic
17	<i>Alternanthera triandra</i> Lam.	Amaranthaceae	<i>Giojhirha</i>	Anti ulcerative
18	<i>Alysicarpus rugosus</i> (Willd.) DC.	Fabaceae	Red Moneywort/Rough Chainpea	Wound healer, seeds used to treat dropsy, gout
19	<i>Amaranthus spinosus</i> L.	Amaranthaceae	Prickly Amaranth	Hyperactive, spasmolytic
20	<i>Amaranthus viridis</i> L.	Amaranthaceae	Green Amaranth	Juvenomimetic,
21	<i>Anamirta cocculus</i> (L.) Wight & Arn.	Menispermaceae	Levant Berries/ Fish Berries	Diuretic anticancerous
22	<i>Andrographis alata</i> (Vahl) Nees	Acanthaceae		Febrifuge, anthelmintic
23	<i>Andrographis lineate</i> Wallich ex Nees	Acanthaceae	Siriyangai	anti-venom, anti-diabetic
24	<i>Anisochilus carnosus</i> (L.f.) Wallich	Lamiaceae	Thick-leaved lavender	Antibacterial, stimulant
25	<i>Anisomeles indica</i> (L.) Kuntze	Lamiaceae	Indian catmint	Hypothermic
26	<i>Argyreia bracteata</i> Choisy	Convolvulaceae	<i>Samudra patta</i>	Spasmolytic
27	<i>Argyreia cuneata</i> (Willd.) ker Gawler	Convolvulaceae	Purple Morning Glory	Diabetes
28	<i>Arisaema leschanaultii</i> Blume	Araceae	Snake Plant/Goosedragon	Rich in starch; antihelmintic
29	<i>Aristolochia indica</i> L.	Aristolochiaceae	Indian Birthwort	Insecticidal, Diuretic, anticancerous
30	<i>Artemisia nilagirica</i> C.B.Clarke	Asteraceae	Indian Wormwood	Antimicrobial, antifungal, larvicidal, insecticidal
31	<i>Artemisia parviflora</i> Buch. -Ham.ex Roxb.	Asteraceae	<i>Ganga Tulsi</i>	Antiviral

S.No.	Name of the plant species	Family	Common English name/ Local name	Medicinal property*
32	<i>Asclepias curassavica</i> L.	Asclepiadaceae	Scarlet Milkweed	Ipecac; emetic, cathartic
33	<i>Atalantia monophylla</i> (L.) Corr. Serr.	Rutaceae	Wild Lime/Jhambir prati	Anti-rheumatic
34	<i>Barleria buxifolia</i> L.	Acanthaceae	<i>Ikshur/Sehchar bhed</i>	Anti-inflammatory, for coughs
35	<i>Blepharis boerhaviifolia</i> Pers.	Acanthaceae	Creeping Blepharis	Diuretic
36	<i>Boerhaavia diffusa</i> L.	Nyctaginaceae	Red Spiderling	Spasmolytic; antiviral, analgesic; anti convulsant; anti arrhythmic
37	<i>Boswellia glabra</i> Roxb.	Burseraceae	Indian frankincense tree, Indian olibanum tree	Diuretic
38	<i>Bridelia roxburghiana</i> (Muell. Arg.) Gehrm.	Euphorbiaceae	<i>Ekdania, gondui, khaja</i>	Anti-viral, hypoglycaemic; hypotensive
39	<i>Buchanania lanzan</i> Sprengel	Anacardiaceae	Chironji Tree	Diarrhoea; anti cancerous anti venomous
40	<i>Buddleja asiatica</i> Lour.	Buddlejaceae	White Butter fly bush	Abortifacient, skin disorders, hypotensive, tonic
41	<i>caesalpinia sepiaria</i> Roxb.	Caesalpiniaceae	Mysore Thorn	Antiviral, antifungal
42	<i>Capparis grandis</i> L.f	Capparaceae	<i>Regutti</i>	Anti-cancer, spasmolytic, diuretic
43	<i>capparis sepiaria</i> L.	Capparaceae	Wild Caper Bush	Febrifuge, skin troubles
44	<i>Capparis zeylancia</i> L.	Capparaceae	Indian Caper	Spasmolytic
45	<i>Caralluma attenuata</i> Wight	Asclepiadaceae	<i>Kunderi kummul</i>	Blood diseases
46	<i>Caralluma umbellata</i> Haw.	Asclepiadaceae	<i>Kalmulyan</i>	Stomachic and abdominal pains
47	<i>Careya arborea</i> Roxb.	Lecythidaceae	Slow Match Tree	antimicrobial, antioxidant, astringent,
48	<i>Carissa spinarum</i> L.	Apocynaceae	Conker berry/Bush Plum	Purgative, pain reliever in toothache, relieve intermittent fever.
49	<i>Caryota urens</i> L.	Palmae	Fishtail Palm	Urinary disorders, laxative, aphrodisiac, coolant, hyperdipsia, fatigue, hemicrania
50	<i>Cassia absus</i> L.	Caesalpiniaceae	Chaksu	Ophthalmia, skin troubles, cathartic, coughs
51	<i>Cassia fistula</i> L.	Caesalpiniaceae	Indian Laburnum, Amaltas	purgative, laxative, black water fever
52	<i>Cassia tora</i> L.	Caesalpiniaceae	<i>Chakunda</i>	purgative, ringworm, skin troubles,
53	<i>Castanea crenata</i> siebold & Zucc.	Fagaceae	Japanese Chestnut	anti allergic, anti irritant to lacquer, bronchial troubles, dyscrasia, eczema, hydrocele
54	<i>Celastrus paniculatus</i> Willd.	Celastraceae	<i>Malkangni</i>	abortifacient, tonic, aphrodisiac, nerve stimulant and brain tonic.
55	<i>Centella asiatica</i> (L.) urban	Umbelliferae	Indian Pennywort	Diuretic, tonic, anti leprosy, antiprotozoal, spasmolytic, minor tranquiliser
56	<i>Chenopodium ambrosioides</i> L.	Chenopodiaceae	Mexican tea	Anthelmintic
57	<i>Chrozophora rottleri</i> Geiseler	Euphorbiaceae	<i>Suryavarth</i>	Cathartic, depurative
58	<i>Cinchona succirubra</i> Klotzsch	Rubiaceae	Peruvian Bark, Red Bark	Febrifuge, yields quinine
59	<i>Cinnamomum camphora</i> (L.) J.S.Presl.	Lauraceae	Camphor Tree	Stimulant diaphoretic, anthelmintic, antiseptic, anodyne, source of natural camphor.

S.No.	Name of the plant species	Family	Common English name/ Local name	Medicinal property*
60	<i>Cinnamomum iners</i> auct.non Blume	Lauraceae	<i>Jangli dalchini</i>	cough and dysentery
61	<i>Cissampelos pareira</i> L.	Menispermaceae	False Pareira, Brava	Diuretic, antiperiodic, purgative, dyspepsia, dropsy, urinary troubles
62	<i>Cissus quadrangularis</i> L.	Vitaceae	Edible-stemmed vine	Analgesic, oxytocic, diuretic, CVS active, bone healing properties, stomachic
63	<i>Citrus medica</i> L.	Rutaceae	Citron	Anti dysenteric
64	<i>Clematis gouriana</i> Roxb. ex.DC.	Ranunculaceae	<i>Churanhar/Morveil</i>	Vesicant
65	<i>Clerodendrum serratum</i> (L.) Moon	Verbenaceae	<i>Barangi</i>	Rheumatism, dyspepsia, ophthalmia, febrifuge, cephalgia
66	<i>Clitoria ternatea</i> L.	Fabaceae	Butterfly Pea	Spasmolytic, cathartic
67	<i>Cochlospermum gossypium</i> DC.	Cochlospermaceae	Buttercup Tree	Diuretic, cardio vascular system active
68	<i>Coleus barbatus</i> (Andrews) Benth.	Lamiaceae	Garmar	Kidney stones, calculus
69	<i>Commiphora caudata</i> (Wight & Arn) Engl.	Burseraceae	Hill Mango	Urinary troubles, asthma, antibacterial
70	<i>Conyza stricta</i> Willd.	Asteraceae	Erect Horseweed	Hypotensive, anti-amphetaminic, CNS depressant
71	<i>Crinum latifolium</i> L.	Amaryllidaceae	Milk and Wine Lily	Anti inflammatory, antifeedant, rheumatism, earache
72	<i>Crotalaria laburnifolia</i> L.	Fabaceae	<i>Muna</i>	Anti inflammatory, anti spasmodic, CNS depressant
73	<i>Cryptolepis buchananii</i> Roemer & Schultes	Asclepiadaceae	Wax leaved climber	Hypotensive, anti-amphetaminic, CNS depressant
74	<i>Curculigo orchoides</i> Gaertner	Hypoxidaceae	Golden Eye Grass	Hypo glycaemic, anti-spasmolytic, anticancerous
75	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Bermuda / Couch Grass	Antifungal, antiviral, Hypoglycaemic
76	<i>Cyperus rotundus</i> L.	Cyperaceae	Common Nut Sedge	Anti inflammatory, antipyretic
77	<i>Dalbergia latifolia</i> Roxb.	Fabaceae	Black Rosewood	Anti Leucoderma
78	<i>Datura metel</i> L.var.fastosa L.Safford	Solanaceae	Downy Datura	Narcotic, antispasmodic, anticancerous, anthelmintic
79	<i>Decalapis hamiltonii</i> Wight & Arn.	Asclepiadaceae	<i>Maridi gadda/ Mahali Kizhangu</i>	Coolant, appetiser and depurative
80	<i>Desmodium gangeticum</i> (L.) DC.	Fabaceae	Sal leaved Desmodium	Febrifuge diuretic, anti-inflammatory, analgesic
81	<i>Desmodium triflorum</i> (L.) DC.	Fabaceae	Creeping Tick Trefoil	Diuretic, galactagogue,
82	<i>Diospyros melanoxylon</i> Roxb.	Ebenaceae	Coromandel Ebony	Diuretic, laxative carminative, styptic
83	<i>Echinops echinatus</i> Roxb.	Asteraceae	Indian Globe Thistle, Camel's Thistle	Diuretic, tonic, hypoglycaemic
84	<i>Eclipta alba</i> (L.) Massk.	Asteraceae	False Daisy	Antiviral, nematocidal, ovicidal, spasmolytic,
85	<i>Embelia ribes</i> Burm.f.	Myrsinaceae	<i>Baberang/Wawrang</i>	Contraceptive, antibacterial, diuretic, oxytocic
86	<i>Embllica officinalis</i> Gaertner	Euphorbiaceae	Indian Gooseberry	Antiviral, antispasmodic, antidiabetic, CNS depressant, CVS active
87	<i>Emilia sonchifolia</i> (L.) DC.	Asteraceae	Purple Sow Thistle	anti-microbial,
88	<i>Erythrina variegata</i> L.	Fabaceae	Indian Coral Tree	Spasmolytic, CNS depressant, anti convulsant
89	<i>Eupatorium glandulosum</i> Kunth	Asteraceae	Sticky Snake root	Haemostatic, diuretic

S.No.	Name of the plant species	Family	Common English name/ Local name	Medicinal property*
90	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Asthma Weed	Hypoglycaemic, anticancerous, anti-protozoal, CVS active, spasmolytic
91	<i>Feronia elephantum</i> Corr. serr.	Rutaceae	Elephant Apple/Wood Apple	Astringent, carminative, anti-scorbutic and alexipharmic
92	<i>Ficus benghalensis</i> L.	Moraceae	Banyan Tree	Hypoglycaemic, astringent anti-diabetic
93	<i>Fumaria parviflora</i> Lam.	Cyperaceae	Shahthra	Astringent, diuretic,
94	<i>Garuga pinnata</i> Roxb.	Burseraceae	Grey Downy balsam	anti-asthmatic, Coolant and digestive properties
95	<i>Gmelina arborea</i> Roxb.	Verbenaceae	Candhahar Tree	Galactagogue, antidote for scorpion sting, demulcent, hypoglycaemic, antiviral
96	<i>Gymnema sylvestre</i> (Retz.) R.Br.	Asclepiadaceae	Australian Cow Plant	Anti-diabetic, stimulant, diuretic
97	<i>Hedychium flavescens</i> Lodd.	Zingiberaceae	Cream hgarland lily, yellow ginger lily, Cream ginger	Carminative, stomachic, stimulant
98	<i>Helicteres isora</i> L.	Sterculiaceae	East Indian Screw Pine Tree	Anti diabetes, antidiarrhoea, anti-dysenteric, spasmolytic, cytotoxic.
99	<i>Hemidesmus indicus</i> (L.) R.Br.	Asclepiadaceae	Indian Sarasaparilla	Blood purifier, diaphoretic, diuretic, demulcent, Skin troubles, ulterative, tonic
100	<i>Heracleum rigens</i> Wallich ex DC.	Umbelliferae	<i>Gaalibeeja</i>	Aphrodisiac, tonic, urinary disorders, cardiac disorders, stomachic
101	<i>Hesperthusia crenulata</i> (Roxb.) M.Roem.	Rutaceae	<i>Karchi</i>	Astringent, antipyretic, anthelmintic, anti dysenteric, stomachic, Anticancerous
102	<i>Holarrhena antidysenterica</i> Wallich	Apocynaceae	Willow leaved Water Croton	Laxative, diuretic
103	<i>Homonioia riparia</i> Lour.	Euphorbiaceae	Black Creeper	Demulcent, tonic, diaphoretic, andtviral, diuretic
104	<i>Ichnocarpus frutescens</i> (L.) R.Br.	Apocynaceae	Physic Nut	Laxative, CNS depressent, diuretic, skin diseases, lactagogue
105	<i>Jatropha curcas</i> L.	Euphorbiaceae	<i>Gandarussa</i>	Diaphoretic, emetic, emmanagogue, febrifuge.
106	<i>Justicia gendarussa</i> Burm.f.	Acanthaceae	Lion's Ear	Spasmolytic, anti diarrhoea, anti cancerous, rheumatism, skin affections
107	<i>Leonotis nepetiifolia</i> (L.) R.Br.	Lamiaceae	<i>Bilvaparni/Beli</i>	Stomachic, tonic, purgative, sudorific
108	<i>Mallotus philippensis</i> Muell.Arg.	Euphorbiaceae	Monkey Face Tree/Kamala Tree	Anthelmintic, Hypoglycaemic, anticancerous, cutaneous affections
109	<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	False Mallow	Emmollient, resolvent, diaphoretic, antidysenteric
110	<i>Melia azedarach</i> L.	Meliaceae	China Berry/False Neem	Spasmolytic, anticancerous, antiviral, anthelmintic
111	<i>Michelia champaca</i> L.	Magnoliaceae	Champak	Hypoglycaemic, CVS active, diuretic, febrifuge, purgative, emmanagogue, stomachic, carminative, dyspepsia
112	<i>Mimosa pudica</i> L.	Mimosaceae	Touch Me Not	Urinary complaints, piles.

S.No.	Name of the plant species	Family	Common English name/ Local name	Medicinal property*
113	<i>Mucuna prurita</i> Hook.	Fabaceae	Velvet Bean	Diuretic, purgative, emmanagogue, elephantiasis, renal affections, CNS active, aphrodisiac,
114	<i>Nicandra physalodes</i> (L.) Gaertner	Solanaceae	Apple of Peru	Anthelmintic, diuretic, insecticide
115	<i>Ocimum canum</i> Sims.	Lamiaceae	Hoary Basil	Diuretic, tonic, coolant, antibacterial, antifungal CNS active
116	<i>Oldenlandia corymbosa</i> L.	Rubiaceae	Diamond Flower	Cooling and pectoral properties, stomachic, nervous depression, liver disorders
117	<i>Oxalis corniculata</i> L.	Oxalidaceae	Creeping Wood Sorrel	Dyspepsia, piles, anaemia, tympanitis
118	<i>Passiflora foetida</i> L.	Passifloraceae	Love in a Mist	CVS active, anti cancer, diuretic, anticephalgic, anti hysteric
119	<i>Pavetta indica</i> L.	Rubiaceae	Indian Pavetta	Diuretic, jaundice, purgative, antidropsical
120	<i>Pergularia extensa</i> (Jacq.) N.E.Br.	Asclepiadaceae	Hair knot Plant	Emetic, expectorant, anthelmintic, uterine and menstrual troubles, spasmolytic, hypothermic, antibacterial, musculotropic
121	<i>Persea gratissima</i> Gaertner.f.	Lauraceae	Avocada/Alligator Pear/ Butter Fruit	Antibiotic
122	<i>Phyllanthus urinaria</i> L.	Euphorbiaceae	Chamber Bitter	Antibacterial, appetiser
123	<i>Physalis peruviana</i> L.	Solanaceae	Cape Gooseberry	Diuretic, anthelmintic, abdominal disorders
124	<i>Pithecellobium dulce</i> (Roxb.) Benth	Mimosaceae	Manila Tamarind	Haemolytic, spermicidal, hair tonic, spasmolytic
125	<i>Plantago asiatica</i> L.	Plantaginaceae	<i>Gul/Isafgol</i>	urinary tract disorders, anti inflammatory, gastro intestinal disorders, chaemostatic, analgesic, febrifuge, astringent, diuretic.
126	<i>Plectanthis coleoides</i> Benth.	Lamiaceae	Variegated Swedish Ivy	Stimulant, vaso constrictor, cardiac depressent
127	<i>Plumbago zeylanica</i> L.	Plumbaginaceae	<i>Chitrak</i>	Abortifacient, vesicant, diuretic, anti-rheumatic, analgesic, skin disorders
128	<i>Polyalthia cerasoides</i> (Roxb.) Beddome	Annonaceae	<i>Kudumi</i>	Febrifuge
129	<i>Polygonum glabrum</i> Willd.	Polygonaceae	<i>Raktharohitahaka</i>	Hypothermic, antiviral, CVS active, febrifuge, jaundiced, debility
130	<i>Polygonum plebeium</i> R.Br.	Polygonaceae	<i>Raniphool/Sarpakshi</i>	Diuretic, anti- diarrhoeal, pneumonia
131	<i>Pongamia glabra</i> Vent.	Fabaceae	Pongam oil Tree, Karanj, Indian Beech	Antibacterial, antifungal, roachicide, insecticide, nematicide, liver disorders, tonic, ulcers
132	<i>Portulaca oleracea</i> L.	Portulacaceae	Common Purslane	Antibacterial, antifertility properties, liver disorders, diuretic, vermifuge, antidyseric, blood purifier
133	<i>Premna tomentosa</i> Willd.	Verbenaceae	Bastard Teak	Stomachic, diuretic
134	<i>Pterocarpus marsupium</i> Roxb.	Fabaceae	Indian Kino tree	Hypoglycaemic, CVS active, astringent, anti-diarrhoeal, anti-dysenteric, anti-diabetic

S.No.	Name of the plant species	Family	Common English name/ Local name	Medicinal property*
135	<i>Punica granatum</i> L.	Punicaceae	Pomegranate	antibacterial, CNS depressent, hypothermic, diuretic, astringent, anti diarrhoeal, bronchial disorders
136	<i>Rhinacanthus communis</i> Ness	Acanthaceae	<i>Palak juhi</i>	Antiseptic, antiparasitic, aphrodisiac, exzema
137	<i>Ricinus communis</i> L.	Euphorbiaceae	Castor	Antiprotozoal, purgative, cathartic, hypoglycaemic, diuretic, skin disorders
138	<i>Rubia cordifolia</i> L.	Rubiaceae	Indian Madder	Astringent, tonic, anti dysenteric, antiseptic, anti venom, deobstruent, vermifuge
139	<i>Ruellia prostrata</i> Poiret	Acanthaceae	<i>Ghodi buddu</i>	Emetic, renal affections, ear troubles
140	<i>Rumex nepalensis</i> Sprengel	Polygonaceae	<i>Pahadi palak</i>	CNS active, cholic and syphillic ulcers, purgative, hypothermic
141	<i>Rungia repens</i> (L.) Nees	Acanthaceae	<i>Kharmor</i>	Vermifuge, diuretic, antifungal,
142	<i>Scilla indica</i> (Wight) Baker	Liliaceae	South Idian Squill	Cardiac stimulant, diuretic, expectorant
143	<i>Secamone emetica</i> (Retz.) Schultes	Asclepiadaceae	<i>Sadaburi</i>	Emetic, acrid
144	<i>Semecarpus anacardium</i> L.f.	Anacardiaceae	Marking Nut tree/Oriental Cashew	Anti-cancer, hypoglycaemic, vesicant, antirheumatic, antiasthmatic, psoriasis, neuralgia, epilepsy, CVS active
145	<i>Sesbania aegyptiaca</i> Poiret	Fabaceae	Common sesban/Egyptian Rattle Pod	CVS active, antiviral, spasmolytic, emmanagogue, astringent, stimulant, anti-diarrhoeal, anthelmintic
146	<i>Sida acuta</i> Burm.f.	Malvaceae	<i>Bariara/Kareta</i>	Demulscent, diuretic, diaphoretic, antipyretic, CNS active, anthelmintic, antiarrhythmic, hypotensive
147	<i>Sida rhombifolia</i> L.	Malvaceae	<i>Bhiunli/Lal barela</i>	Rheumatism, tubersulosis, diuretic, febrifuge, demulscent, skin disorders, spasmolytic, anthelmintic, CNS depressent
148	<i>Sigesbeckia orientalis</i> L.	Asteraceae	The Holy Herb	Gangrene ulcers, cardi tonic, diaphoretic, anti-scorbutic, renal affections, rheumatism, antiviral, hypoglycaemic
149	<i>Solanum indicum</i> auct.non.L.	Solanaceae	Poison Berry	CVS active, anticancer, carminative, anti-emetic, expectorant
150	<i>Solanum nigrum</i> L.	Solanaceae	Black Nightshade	CVS active, antiseptic, diuretic, laxative, antispasmodic, cathartic, cardio diseases, liver disorders, spasmolytic,
151	<i>Spilanthes acmella</i> Murray	Asteraceae	<i>Eripaccha, Kuppanmanjal</i>	CVS active, spasmolytic, antidontalgic, diuretic, purgative, anti inflammatory, sialagogue, insecticidal
152	<i>Stellaria media</i> (L.) Villars	Caryophyllaceae	Chickweed	Anti-inflammatory, plaster for broken bones and swellings
153	<i>Stephania japonica</i> (Thunb.) Miers	Menispermaceae	Tape vine	Anti diarrhoeal, anti-spasmodic
154	<i>Sterculia urens</i> Roxb.	Sterculiaceae	<i>Gular</i>	Anti pleuropneumonic, Throat troubles,
155	<i>Strychnos nux-vomica</i> L.	Loganiaceae	Snake wood/Nux vomica/Strychnnine Tree	Spasmolytic, muscle relaxant activity, febrifuge, nervous disorders, epilepsy, anti-dysenteric, stimulant

S.No.	Name of the plant species	Family	Common English name/ Local name	Medicinal property*
156	<i>Taraxacum officinale</i> Wigg.	Asteraceae	Common Dandelion	Laxative, diuretic, hepatic stimulant, hypoglycaemic, anti tumorous.
157	<i>Tephrosia purpurea</i> (L.) Pers.	Fabaceae	Wild Indigo	CNS active, antiprotozoal, anti-hepatotoxic, laxative, diuretic, deobstruent, anti-rheumatic, vermifuge, skin disorders, anti-asthmatic
158	<i>Terminalia arjuna</i> Wight & Arn.	Combretaceae	Arjuna	CVS and CNS active, anti-dysenteric, diuretic, febrifuge, deobstruent, abortifacient
159	<i>Terminalia bellirica</i> (Gaertner) Roxb.	Combretaceae	Belleric Myrobalan	Anti-cancerous, anaemia, astringent, purgative, leucoderma, rheumatism, ophthalmic disorders, diuretic, cardio disorders, demulscent
160	<i>Terminalia chebula</i> Retz.	Combretaceae	Cherubic Myrobalan	Laxative, antispasmodic activity, antiasthmnaatic, cardi tonic, dentfrices, stomach disorders, carminative
161	<i>Tinospora cordifolia</i> Hook.f. & Thomson	Menispermaceae	Gulanca Tinospora	Anti-pyretic, anti-spasmodic, anti inflammatory, urinary diseases, hypoglycaemic, emetic, rheumatism, jaundice, skin diseasesanalgesic
162	<i>Tithonia diversifolia</i> (Hemsley) A.Gray	Asteraceae	Mexican Sunflower	Skin disorders
163	<i>Tragia involucrata</i> L.	Euphorbiaceae	Indian Stinging Nettle	Hypothermic, diuretic, diaphoretic, anti leprotic, skin affections, liver disorders,
164	<i>Trema orientalis</i> (L.) Blume	Ulmaceae	Charcoal Tree/Indian Nettle Tree	Antidiarrhoeal, epilepsy, CNS active, muscular pain reliever
165	<i>Trichodesma zeylanicum</i> (Burm.f.)	Boraginaceae	Hetenuria/Jalasarasa	Demulscent, diuretic, CNS active, hypothermic, analgesic
166	<i>Vallisneria spiralis</i> (L.) Kuntze	Apocynaceae	Ramsar/Chamari-ki-vel	Astringent, skin affections
167	<i>Vanda tessellata</i> (Roxb.) Don.	Orchidaceae	Banda/Nai/Rasna	anti-arthritis, Anti inflammatory, anti-pyretic, anti-bacterial, anti-tuberculosis, nerve disorders, anti-rheumatic, tonic to liver and brain
168	<i>Ventilago maderaspatana</i> Gaertner	Rhamnaceae	Pitti	Stimulant, stomachic, tonic, skin affections, antialergic, carminative, atonic dyspepsia
169	<i>Vinca major</i> L.	Apocynaceae	Greater Periwinkle	Hypotensive, anti haemmoeragic, anti galactagogue, abortifacient
170	<i>Waltheria indica</i> L.	Sterculiaceae	Nallabenda	Purgative, febrifuge, emollient, anti haemmoeragic,
171	<i>Wrightia tinctoria</i> (Roxb.) R.Br.	Apocynaceae	Pala Indigo Plant	Anti-coagulant, skin disorders, anti-dysenteric, aphrodisiac, anthelmintic
172	<i>Xanthium strumarium</i> L.	Asteraceae	Cocklebur/Burweed	Anti-epileptic, diuretic diaphoretic, sedative, anti tumorous, anti inflammatory, astringent

*Source: Jain, 1991; Pandravada and Sivaraj, 1999; Pandravada et al., 2000; Thammanna and Narayana Rao, 1988; Varaprasad et al., 2006; Vedavathy et al., 1997; Sivaraj et al., 2006; Sivaraj et al., 2015.

Legumes used for treating various ailments of the body *i.e.*, ear, nose and throat and eyes (ophthalmic, odontalgic, sternutatory); Chest and lungs (antiasthmatic, demulcent, expectorant); Heart and blood (cardiac, blood purifier, vasodilator); Liver and kidneys (hepatic, antbilious); Stomach (emetic, stomachic, digestive); Bowels and bladder (purgative, laxative, carminative); Nerves and muscles (antispasmodic, nervine); Bones (anti-inflammatory, antirheumatic); Skin, hands and feet (acrid, skin applications); Sex and reproduction (abortifacient, aphrodisiac, galactogogue); Wounds and bruises (antiseptic, poultice, vulnerary); Fever (febrifuge); Infectious diseases (antiperiodic, VD); Bites and stings (antidote, stings); Cancer (cancer); Fungi and bacteria (antibacterial, antifungal) are reviewed and reported earlier (Varaprasad et al., 2006).

The Malayali tribes of the Southern Eastern Ghats

region are using 189 plant species belonging to 86 families for the treatment of 85 diseases (Suresh, 2010). Tribals of Rayalaseema region of Eastern Ghats are using about 54 plant species belonging to 50 genera and 34 families for treating asthma alone (Anjaneyulu and Sudarsanam, 2013). The tribal areas of Rayalaseema have reported about 70 medicinal plants species for gynecological and abortive proeptries (Nagalakshmi, 2001). Eastern Ghats of Odisha has a potential ethnomedicinal resources for treating various human diseases particularly rheumatism for about 62 genera with 78 plant species includes *Acanthus ilicifolius*, *Thunbergia fragrans*, *Cerbera odollum*, *Guizotia abyssinica*, *Derris scandens*, *Flacourtia indica*, *Pandanus fascicularis*, *Sesamum indicum* and *Stachytarpheta jamaicensis* (Panda et al., 2014). Some of the major Eastern Ghats Ethnic groups and their traditional healthcare knowledge systems are presented in Table 3.

Table 3. Eastern Ghats ethnic groups and traditional healthcare knowledge systems.

Tribal Group	Number of Plant families/ genera / species used	Major species and ailments	Reference(s)
Southern Eastern Ghats			
<i>Malayalis</i>	86 plant families/ 147 genera/250 species	<i>Achyranthes aspera</i> (piles) <i>Aegle marmelos</i> (fever) <i>Andrographis paniculata</i> (poisonous bite) <i>Clematis gouriana</i> (eye diseases) <i>Macaranga peltata</i> (Kidney stones) <i>Michelia champaca</i> (scorpion sting), <i>Naravelia zeylanica</i> (skin disease), <i>Nymphaea nouchali</i> (urinary problem) <i>Randia dumetorum</i> (lice and dandruff) <i>Tinospora sinensis</i> (rheumatism), <i>Watakaka volubilis</i> (diabetes)	Alagesaboopathi et al. (1999) Dwakaran et al. (1994) Francis Xavier et al. (2011) Karthik et al. (2011); Karthik (2013) Palanisamy et al. (2011) Prabu and Kumuthakalavalli (2012) Senthilkumar et al. (2013) Suresh (2010); Suresh et al. (2011) Vaidyanathan et al.(2013)
<i>Irulas</i>	57 species	<i>Achyranthes bidentate</i> (Anti-fertility) <i>Blepharis maderaspatensis</i> (Mother care) <i>Caralluma attenuate</i> (Urinary troubles) <i>Cymbopogon citratus</i> (repellent) <i>Datura innoxia</i> (mental illness) <i>Ocimum americanum</i> (lice treatment) <i>Solanum virginianum</i> (cough) <i>Vernonia cinerea</i> (Poisonous bite)	Mohamed Tariq et al. (2012) Kadavul. and Dixit (2009)
<i>Nakkala, Sugalis or Lambadas, Yerukalas</i>	120 families/179 genera/204 species	<i>Abrus precatorius</i> (Gonorrhoea, night blindness, leucoderma) <i>Cassia auriculata</i> (bone fracture) <i>Nerium oleander</i> (cuts and wounds)	Anjaneyulu and Sudarsanam (2013); Basha et al. (2010) Ramana Naidu et al.(2012) Thammana and Rao (1998) Vedavathy and Rao (1994) Vedavathy et al. (1997)
Middle Eastern Ghats			
<i>Chenchus</i>	69 plant species	<i>Syzygium cumini</i> (ear ache, dysentery) <i>Andrographis paniculata</i> (fever, jaundice)	Ravi Prasad Rao and Sunita, (2011)

Tribal Group	Number of Plant families/ genera / species used	Major species and ailments	Reference(s)
Gonds	59 plant species	<i>Euphorbia hirta</i> (ulcers and fissures, warts) <i>Andrographis echioides</i> , <i>Boerhavia diffusa</i> <i>Canavalia gladiata</i> , <i>Phyllanthus amarus</i> , <i>Physalis minima</i> , <i>Tephrosia purpurea</i> (liver ailments)	Sabjan et al. (2014)
		<i>Acacia Arabica</i> , <i>Albizia odoratissima</i> (antidote) <i>Atalantia monophylla</i> (rheumatism) <i>Cayratia pedata</i> (uterine disorder, <i>Convolvulus sepriaria</i> (fertility) <i>Cyanotis tuberosa</i> (cough) <i>Litsea glutinosa</i> (wound healing) <i>Putranjiva roxburghii</i> (impotency) <i>Sterculia urens</i> (male sterility) <i>Xylia xylocarpa</i> (skin)	Murthy (2012) Suman Kumar et al. (2013)
Bagatas, Konda doras, Kotias and Konds	98 species	<i>Annona squamosa</i> (wounds), <i>Polyalthia longifolia</i> (rheumatism) <i>Cissampelos pariera</i> (stomachic), <i>Nelumbo nucifera</i> (dysentery), <i>Brassica juncea</i> (diarrhea), <i>Ziziphus xylopyrus</i> (asthma), <i>Pterocarpus marsupium</i> (eczema)	Padal et al. (2010) Padal et al. (2013)
Northern Eastern Ghats			
Paroja, Saora, Bhumia, Godaba, Dogaria and Kondha	77 plant species	<i>Caryota urens</i> , <i>Curcuma montana</i> , <i>Sansiveria roxburghiana</i> , <i>Sesbania grandiflora</i> , <i>Elephantopus scaber</i> (liver disorders)	Smita et al. (2012) Panda and Misra (2011) Panda et al. (2014)
Bonda, Didayi, Koya, Bhatoda and Kondh	34 plant species	<i>Barleria prionitis</i> (cough) <i>Bauhinia vahlii</i> (dysentery) <i>Cassia fistula</i> (leprosy) <i>Plumbago zeylanica</i> (abortifacient) <i>Ricinus communis</i> (head ache) <i>Semecarpus anacardium</i> (wound healing) <i>Pterocarpus marsupium</i> (diabetes)	Pattanaik et al. (2009)
Santhals, Kols and Kharias	34 plant families/58 species	<i>Aristolochia indica</i> (snake bite) <i>Ficus racemosa</i> (cough and cold) <i>Hygrophila auriculata</i> (Health food) <i>Morinda citrifolia</i> (Body pain) <i>Pueraria tuberosa</i> (Joint pains) <i>Soymida febrifuga</i> (Malarial fever) <i>Syzygium cerasoides</i> (Leucorrhoea)	Rout et al. (2009)
Juang, Kondha, Kol, Bhomij, Bhuiya, Bathudi, Kharia, Gond, Makid, Pauri-Bhuyan, Mahalis, Sounti and Saharas	551 plant species	<i>Oroxylum indicum</i> (dysentery) <i>Paederia scandens</i> (diarrhoea) <i>Piper cubeba</i> (carminative) <i>Pterocarpus marsupium</i> (diabetes) <i>Santalum album</i> (gonorrhoea, syphilis) <i>Scindapsus officinalis</i> (asthma) <i>Semecarpus anacardium</i> (ovarian cancer) <i>Smilax zeylanica</i> (gynatone) <i>Solanum khasianum</i> (cough, asthma)	Pandey et al. (2002) Dikshit and Sivaraj (2014) Rout and Pandey (2007) Mohanta et al. (2006)

Traditional medicinal plant wealth in ethnic local health practices

Eastern Ghats tribal communities use medicinal plants for treating various ailments. The medicinal plant taxa used in local health traditions are enlisted below (disease-wise):

Abortifacients

Abrus precatorius, *Acacia leucophloea*, *Lawsonia inermis*, *Sterculia urens*, *Maduca longifolia* var. *latifolia*, *Ricinus communis*, *Aristolochia bracteolata*, *Plumbago zeylanica*, *Carica papaya*, *Holoptelea integrifolia*, *Dolichos biflorus*, *Plumbago rosea*.

Antidote for poisonous bites (snakes, scorpion)

Gymnema sylvestre, *Rauwolfia serpentina*, *Vernonia cinerea*, *Aristolochia indica*, *Cassia glauca*, *Asparagus racemosus*, *Hemidesmus indicus*, *Cissampelos pariera*, *Corallocarpus epigaeus*, *Strychnos nux-vomica*, *Holarrhena antidysenterica*, *Acalypha indica*, *Leucas aspera*, *L. cephalotes*, *Uriaria picta*, *Symphorema polyandrum*, *Celastrus paniculatus*, *Tinospora cordifolia*, *Soymida febrifuga*, *Dalbergia paniculata*, *Sapindus emarginatus*, *Cleistanthus collinus*, *Butea monosperma*, *Ziziphus xylopyrus*, etc. for poisonous snake bites. *Santalum album*, *Canavalia virosa*, *Strychnos potatorum*, *Ziziphus mauritiana*, *Cassia auriculata*, *Tridax procumbens*, *Martynia annua*, *Andrographis paniculata*, *Leucas cephalotes*, *Aegle marmelos*, *Leonotis nepetifolia*, *Geodorum candidum*, *Rauwolfia serpentina*, *Soymida febrifuga*, *Clerodendrum serratum*, *Calotropis gigantea*, *Boswellia serrata*, etc. are used for scorpion sting.

Anti-fertility (Contraceptives)

Achyranthes aspera, *Aristolochia bracteolata*, *Mitragyna parvifolia*, *Allium sativum*, *Embelia tsjeriam-cottam*, *Cuminum cyminum*, *Schleichera oleosa*, *Plumbago zeylanica*, *Piper nigrum*, *Zingiber officinale*, *Capsicum annum*, *Argyrea nervosa*, *Abrus precatorius*, *Aristolochia indica*, *Tamaridus indica*, *Salvadora persica*, *Ricinus communis*, *Crotalaria juncea*, *Phyllanthus amarus*, *Momordica dioica*, *Saccharum officinarum*, *Hibiscus rosasinensis*, *Dodonaea viscosa*, *Nymphaea nouchali*, *Strychnos nux-vomica*, *Butea monosperma* and *Balanites aegyptica* are used as contraceptives.

Aphrodisiacs and nervine

Curculigo orchioides, *Hybanthus suffruticosus*, *Clitoria ternatea*, *Maerua oblongifolia*, *Ipomoea mauritiana*, *Bombax ceiba*, *Hemidesmus indicus*, *Cuminum cyminum* and *Mucuna pruriens* are used aphrodisiacs and nervine tonics.

Arthritis, body pains, fits

Dichrostachys cinerea, *Azima tetracantha*, *Barleria prionitis*, *Lawsonia inermis*, *Limonia acidissima*, *Derris indica*, *Moringa concanensis*, *Sterculia urens*, *Cassia tora*, *Capparis sepiaria*, *Dregea volubilis*, *Ailanthus excels*, *Celosia argentea*, *Terminalia arjuna*, *Delonix alata*, *Ficus religiosa*, *Erythrina indica*, *Vitex negundo*, *Plecosperrum spinosa*, *Diplocyclos palmate*, *Albizia lebeck*, *Semecarpus anacardium*, *Dodonaea viscosa*, *Cassytha filiformis*, *Atalantia monophylla*, *Atylosia scarabaeoides*, *Alstonia scholaris*, *Leonatis nepetifolia*, *Hemidesmus indicus*, *Aristolochia indica*, *Derris indica*, *Butea monosperma*, *Trianthema portulacastrum*, *Boerhaavia diffusa*, *Acalypha indica*, *Elytraria acaulis*, *Cryptolepis buechanani*, *Decalepis hamiltonii*, *Erythrina suberosa*, *Holarrhena antidysenterica*, *Mimosa rubicaulis*, *Zingiber roseum*, *Bacopa monnieri*, *Gossypium herbaceum*, *Bridelia retusa*, *Garuga pinnata*, *Phyllanthus emblica*, *Gardenia turgid*, *Holoptelea integrifolia*, *Cassia occidentalis*, *Morinda tomentosa* and *Clerodendrum phlomidis* are used for the ailment of arthritis, body pains and fits.

Child care

The medicinal plants, *Acorus calamus*, *Cryptolepis buechanani*, *Pterocarpus marsupium*, *Holostemma adakodien*, *Emilia sonchifolia*, *Oxalis corniculata*, *Helicteres isora*, *Sida acuta*, *Dichrostachys cinerea*, *Phyllanthus nodiflora*, *Mukia maderaspatana*, *Casearia elliptica*, *Aegle marmelos*, *Cucurbita maxima*, *Citrus aurantifolia*, *Curcuma longa*, *Chloroxylon swietenia*, *Terminalia bellerica*, *Aristolochia indica*, *Aristolochia bracteolata*, *Ximenia americana*, *Blepharispermum subsessile*, *Gymnema sylvestre*, *Argemone mexicana*, *Tridax procumbens*, *Cynodon dactylon*, *Ailanthus excelsa*, *Pavonia odorata*, *Ziziphus xylopyrus*, *Blumea eriantha*, *Ziziphus rugosa*, *Lepidagathis hamiltoniana*, *Lepidagathis cristata*, *Hygrophila auriculata*, *Tamarix ericoides* and *Borassus flabellifer* are used for different ailments during child care.

Cough and cold

Different preparations from *Leucas aspera*, *Hemionitis arifolia*, *Abrus precatorius*, *Euphorbia tirucalli*, *Pergularia daemia*, *Trachyspermum ammi*, *Solanum surattense*, *Azanza lampas*, *Acacia torta*, *Acacia caesia*, *Leucas linifolia*, *Leucas aspera*, *Leucas cephalotes*, *Phyla nodiflora*, *Ficus racemosa*, *Ficus benghalensis*, *Cardiospermum halicacabum*, *Cadaba fruticosa*, *Coccinia grandis*, *Pergularia daemia*, *Solanum nigrum*, *Leucas aspera*, *Barleria prionitis*, *Elephantopus scaber*, *Vanda tessellate*, *Rhynchosyris retusa*, *Sesamum indicum*, *Strychnos nuxvomica* and *Tinospora cordifolia* are used to treat cough and cold.

Diabetes

Rauvolfia serpentina, *Aegle marmelos*, *Gymnema sylvestre*, *Strychnos potatorum*, *Acacia chundr*, *Syzygium cumini*, *Azadirachta indica*, *Flacourtia indica*, *Coccinia grandis*, *Barleria prionitis*, *Leucas linifolia* and *Pterocarpus santalinus* are used for diabetic conditions.

Diarrhoea and dysentery

Lantana camara var. *aculeata*, *Holoptelea integrifolia*, *Desmodium gangeticum*, *Grewia hirusta*, *Diospyros exsculpta*, *Brassica juncea*, *Abrus precatorius*, *Anogeissus acuminata*, *Cassia auriculata*, *Cassia holosericea*, *Justicia glauca*, *Lannea coromandelica*, *Euphorbia prostrata*, *Helicteres isora*, *Psidium guajava*, *Carmona retusa*, *Terminalia chebula*, *Anisomeles indica*, *Cassia auriculata*, *Solanum erianthum*, *Maytenus emarginata*, *Tectona grandis*, *Triumfetta rhomboidea* and *Cyanotis tuberosa* are utilized for the treatment of diarrhoea and dysentery.

Dysmenorrhoea

The medicinal preparations from *Andrographis paniculata*, *Coccinia grandis*, *Soymida febrifuga*, *Momordica charantia*, *Holarrhena antidysenterica*, *Citrullus colocynthis*, *Cardiospermum canescens*, *Capparis sepiaria*, *Musa paradisiaca*, *Citrus aurantifolia*, *Pergularia daemia*, *Semecarpus anacardium*, *Butea monosperma*, *Sphaeranthus indicus*, *Arachis hypogaea*, *Haldina cordifolia*, *Sesamum indicum*, *Maytenus emarginata*, *Cassia auriculata*, *Cuminum cyminum*, *Sorghum vulgare*, *Eclipta alba*, *Elettaria cardamomum*, *Curcuma longa*, *Momordica*

dioica, *Madhuca longifolia* var. *latifolia*, *Phaseolus radiates*, *Erythrina suberosa*, *Ougeinia oojeinensis*, *Butea monosperma*, *Atylosia scarabaeoides*, *Sida cordifolia*, *Soymida febrifuga*, *Eriolaena hookeriana*, *Securinega leucopyrus* and *Cassia auriculata* are used for dysmenorrhoea.

Epilepsy

For this condition, *Solanum indicum*, *Helianthus annuus*, *Gardenia turgida*, *Maytenus emarginata*, *Hemidesmus indicus*, *Brassica nigra*, *Chloroxylon swietenia*, *Holoptelea integrifolia*, *Vitex negundo*, *Cassia occidentalis*, *Acalypha indica*, etc. are used.

Eye diseases

The medicinal plants used for various eye diseases include *Curculigo orchoides*, *Ocimum americanum*, *Carmona retusa*, *Chloroxylon swietenia*, *Phyllanthus amaranus*, *Cassia occidentalis*, *Soymida febrifuga*, *Achyranthes aspera*, *Ocimum tenuiflorum*, *Careya arborea*, *Strychnos potatorum*, *Tinospora sinensis*, *Cassia absus*, *Ziziphus mauritiana*, *Achyranthes aspera*, *Argemone mexicana*, *Eclipta alba*, *Aloe barbadensis*, *Gymnema sylvestre*, etc.

Facial paralysis

Flacourtia indica, *Capparis sepiaria*, *Dichrostachys cinerea*, *Gmelina arborea*, *Capsicum annum*, *Holoptelea integrifolia*, etc. are used for facial paralysis

Fertility promoting plants

The fertility promoting plants used are: *Maerua oblongifolia*, *Ferula assafoetida*, *Grewia tenax*, *Ficus religiosa*, *Terminalia bellirica*, *Smilax zeylanica* and *Tectona grandis*.

Heart disorders

Following are the plants used for certain heart disorders: *Pterocarpus santalinus*, *Atalantia monophylla*, *Sida acuta*, *Terminalia arjuna*, *Terminalia alata*, *Cardiospermum halicacabum*, *Mitragyna parviflora*, etc.

Hepatic disorders

Phyllanthus amarus, *Lagenaria siceraria*, *Ficus hispida*, *Luffa acutangula* var. *amara*, *Trachyspermum ammi*,

Andrographis paniculata, *Azadirachta indica*, *Holarrhena antidysenterica*, *Cordia dichotoma*, *Benincasa hispida*, *Cassia tora*, *Curcuma angustifolia*, *Diospyros montana*, *Lawsonia inermis*, *Oroxylum indicum*, *Curcuma longa*, *Phyllanthus amarus*, *Solanum nigrum*, *Ricinus communis*, *Boerhaavia diffusa*, *Leucas linifolia*, *Lecua aspera*, *leucas cephalotes*, *Cassia occidentalis*, *Papaver somniferum*, *Eclipta alba*, *Acalypha indica*, *Balanties aegyptica* and *Butea monosperma* are used for hepatic disorders.

Immunity modulators

Aegle marmelos, *Ailanthus excelsa*, *Albizia lebeck*, *Andrographis paniculata*, *Asparagus racemosus*, *Atalantia monophylla*, *Azima tetracantha*, *Capparis sepiaria*, *Clerodendrum phlomidis*, *Dichrostachys cinerea*, *Gmelina arborea*, *Hemidesmus indicus*, *Hesperethusa crenulata*, *Holarrhena antidysenterica*, *Moringa oleifera*, *Oroxylum indicum*, *Plumbago zeylanica*, *Pterocarpus marsupium*, *Solanum surattense*, *Soymida febrifuga*, *Streospermum suaveolens*, *Terminalia chebula*, *Tinospora cordifolia*, etc. are used as immunomodulatory medicinal plants.

Leucorrhoea

Hibiscus micranthus, *cassytha filiformis*, *Ficus racemosa*, *Mangifera indica*, *Syzygium cumini*, *Cassia occidentalis*, *Curcuma longa*, *Argemone mexicana*, *Aerva lanata*, *Cuminum cyminum*, *Bombax ceiba*, *Vernonia anthelmintica*, *Terminalia bellirica*, *tephrosia purpurea*, *Sida acuta*, *Abrus precatorius*, *Derris indica*, *Momosa pudica*, *Erythrina indica* and *Cuminum cyminum* are used for leucorrhoea.

Malaria and other fevers

For various kinds of fevers, *Andrographis paniculata*, *Cissampelos pareira*, *Nyctanthes arboristis*, *Soymida febrifuga*, *Vitex peduncularis*, *Terminalia alata*, *Ailanthus excels*, *Mimosa pudica*, *Paederia foetida*, *cleome petaphylla*, *Flacourtia indica*, *Aristolochia indica*, *Rauwolfia serpentina*, *Evolvus alsinoides*, *A ganosma caryophyllata*, *Aerva lanata* and *Malaxis rheedii* are used.

Mis-carriage of pregnancy

For this, *Vernonia cinerea*, *mimosa pudica*, *Achyranthes aspera*, *Eclipta alba*, *Ocimum sanctum*, *Caesalpinia*

bonduc and other species are used.

Menorrhagia

Bauhinia racemosa, *Prosopis cineraria*, *Canavalia virosa*, *Hemidesmus indicus*, *Arachis hypogaea*, *Hemidesmus indicus*, *Lepidagathis hamiltoniana*, *Abelmoschus ficulneus*, *Terminalia alata* and *Argemone Mexicana* are utilized.

Mother care

Many plants, viz., *Acacia catechu*, *Butea monosperma*, *Allium sativum*, *Zingiber officinale*, *Capsicum annum*, *Cuminum cyminum*, *Cinnamomum zeylanicum*, *Acacia catechu*, *Aacacia chundra*, *Hesperethusa crenulata*, *Holoptelea integrifolia*, *Chloroxylon swietenia*, *Alangium salviifolium*, *Oroxylum indicum*, *Cassia occidentalis*, *Asparagus racemosus*, *Dillenia pentagyna*, *Piper longum*, *Salvodora perscia*, *Dichrostachys cinerea*, *Brassica nigra*, *symphorema involucreatum*, *Canthium parviflorum*, *Trachyspermum ammi*, *Derris indica*, *Holoptelea integrifolia*, *Mundulea sericea*, *Mollugo pentaphylla*, *Ixora arborea*, *Tectona grandis*, *Oryza sativa*, *Raagi java*, *Eleusine coracana*, *Sorghum vulgare*, *Achyranthes aspera*, etc. are used in mother care.

Paralysis

The plants like *Smilax zeylanica*, *Azima tetracantha*, *Symphorema involucreatum*, *Derris indica*, etc. are known to be used for paralysis.

Respiratory disorders

Several plants are used for respiratory disorders, which include: *Boswellia serrata*, *Dolichandrone falcata*, *Strychnos potatorum*, *Tridax procumbens*, *Strychnos nux-vomica*, *Ocimum sanctum*, *Trachyspermum ammi*, *achyranthes aspera*, *Capparis zeylanica*, *Andrographis paniculata*, *Anisochilus carnosus*, *Vernonia anthelmintica*, *Semecarpus anacardium*, *Euphorbia thymifolia*, *Barringtonia acutangula*, *Aegele marmelos*, *Anogeissus latifolia*, *Pergularia daemia*, *Leucas aspera*, *Ocimum sanctum*, *Borassus flabellifer*, *Evolvulus alsinoides*, *Dendrocalamus strictus*, *Echinops echinatus*, *Solanum surattense*, *Acalypha indica*, *Plumbago zeylanica*, *Solanum trilobatum*, *Cissus quadrangularis*, *ziziphus oenoplia*, *Euphorbia hirta*, *Calatropis gigantea*, *Echinops echinatus*, *Albizia lebeck*, *Alangium*

salviifolium, *Leucas cephalotes*, *Helictres isora*, *Mitragyna parvifolia*, *Derris indica*, *Terminalia arjuna*, *Petrocarpus marsupium*, *Cassia occidentalis* and *Aristida adscensionis*.

Skin diseases

For various kinds of skin diseases, *Grewia rhamnifolia*, *Urginea indica*, *Urgenia raogibikei*, *Urgenia nagarjunae*, *Elytraria acaulis*, *Opuntia dilleni*, *Holoptelea integrifolia*, *Cissus pallida*, *Ventilago calyculata*, *Ximenia americana*, *Boswellia seretta*, *Premna tomentosa*, *Ochna suarrosa*, *Zizipus mauritiana*, *Eleusine coracana*, *Ailanthus excelsa*, *Tamarindus indica*, *alanguium salviifolium*, *Phyllanthus emblica*, *Argemone mexicana*, *Moringa olifera*, *Albizia amara*, *Hyptis suaveolens*, *Annona squamosa*, *Terminalia chebula*, *Anisochilus carnosus*, *Coldenia procumbens*, *Commiphora caudata*, *Colocasia esculenta*, *Piper longum*, *Ficus hispida*, *Urginea nagarjunae*, *Solonum melangena*, *Holoptelea integrifolia*, *Ocimum americanum*, *Dendrocalmus strictus*, *Madhuca longifolia*, *Barleria prionitis*, *Rubia cordifolia*, *Trichosanthes tricuspidata*, *Terminalia arjuna*, *Pterocarpus santalinus*, *Mundulea sericea*, *Nerium indicum* and *Hesperethusa crenulata* are used.

Viral, bacterial and fungal attacks

Lygodium flexuosum, *Curcuma longa*, *Abrus precatorius*, *Mimosa pudica*, *Solanum surattense*, *Xanthium strumarium*, *Adiantum lunulatum*, *Chenopodium anthelminticum*, *Aristolochia indica*, *Barringtonia acutangula*, *Schleichera oleosa*, *Hemidesmus indicus*, *Solanum indicum*, *Azadirachta indica*, *Commiphora mukul*, *Brassica juncea*, *Acorus calamus*, *Achyranthese aspera*, *Brassica juncea*, *Acorus calamus*, *Calotropis gigantea*, *Leucas aspera*, *Albizia lebbeck*, *Morinda tomentosa*, *Gardenia gummifera*, *Gardenia resinifera*, *Clerodendrum viscosum*, *Solanum giganteum*, *Polycarpaea corymbosa*, *selaginella rupestris* and *Adiantum incisum* are used for various microbial diseases including viral diseases.

The detailed treatise on Eastern Ghats tribal medicine for various ailments and vast recipes are provided by Hemadri (2011).

Conservation strategies

Regional Stations of the ICAR-National Bureau of Plant

Genetic Resources (NBPGR) located at Cuttack and Hyderabad have made extensive exploration surveys and collected about 1,800 accessions of medicinal and aromatic plant species from this region and the same has been documented. Some of the endangered/endemic medicinal plants collected include *Acorus calamus*, *Aegle marmelos*, *Costus speciosus*, *Cycas beddomii*, *Gloriosa superba*, *Gymnema sylvestre*, *Mucuna pruriens*, *Plumbago indica*, *Rauvolfia serpentina* and *Withania somnifera*. Collections of dye yielding plants include *Bixa orellana* and *Mallotus philippensis* while collections of aromatic plants include *Artemisia spp*, *Cymbopogon spp*, *Ocimum spp*, *Vetiveria zyzanioides* etc. To further the sustainable use of the medicinal plant wealth of the region, NBPGR has conducted grassroot level training programmes to create awareness among rural folk and local health practitioners.

The seed material of different seed bearing orthodox medicinal plant species collected is stored at -20°C with seed moisture brought down to 5 - 8% and RH being maintained at 25-32% in the National Gene Bank at NBPGR. In some difficult species, which are recalcitrant, pollen and seed material is stored at -180°C in liquid nitrogen in the Cryo tanks at NBPGR.

For medium term conservation, the seed material is stored at 7°C with the seed moisture brought down to 5 - 8% and RH being maintained at 30-35% in the cold storage modules at NBPGR Regional Station, Hyderabad. The medicinal plant species, which are non-seed bearing, and those, which are multiplied by vegetative means (stem cuttings/ root cuttings/ whole plant), are being maintained in the glass house/ field gene bank at NBPGR Regional Station, Hyderabad in live condition.

Genomic resources of ethnic medicinal plant diversity such as cloning vectors, expression vectors, binary vectors, RFLP probes, Cloned genes, promoters fused to reporter genes, Sub-genomic, cDNA, EST, repeat enriched libraries, BAC, YAC, PAC clone set from sequencing projects, genomic, mitochondrial or chloroplast DNA, Cloned DNA from wild medicinal plant species produced exclusively for the repository can be stored in the repository by following storage methodologies:

- 1–2 years at 4°C; 4-7 years at -20°C and greater than 5 years when stored at -70°C
- ESTs, full-length cDNAs, BACs, PACs and YACs, are maintained in 96-well or 384-well micro plates at -80°C

- cDNA clones as plasmid DNA at -20°C
- Lyophilized DNA for long-term storage
- Ambient temperature storage

To effectively plan a conservation programme especially for *in-situ* approaches, the occurrence/ passport data enlisted will be useful in delineating species rich areas in general and diversity rich pockets in particular in the surveyed region. The Medicinal Plants Conservation Centre (MPCC), Hyderabad, created eight medicinal plant conservation areas in the Eastern Ghats region of Andhra Pradesh and a total of 715 medicinal plant species have been identified and conserved in these areas (Jadhav and Reddy, 2002). Based on the deliberations during the Conservation Assessment Management Plan (CAMP) workshop organised by the MPCC in 2001, the threat status for some of the medicinal plant species of this region has been assessed. Concerted and collaborative efforts are highly warranted for sustainable management of medicinal plant wealth in the Eastern Ghats.

Conflict of interest statement

Authors declare that they have no conflict of interest.

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