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Ethnomedicinal Knowledge of Inhabitants from Gundlabrahmeswaram Wildlife Sanctuary (Eastern Ghats), Andhra Pradesh, India

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ABSTRACT

The present study explores the traditional herbal knowledge of ethnic tribes from 18 villages located in Gundlabrahmeswaram wildlife sanctuary, Andhra Pradesh, India.

Objective: The main aim of the study is to document the ethnomedicinal plant taxa used by the ethnic people inhabiting the sanctuary area in which specific data was not available for the region.

Methods: Regular field trips were conducted in the ethnic villages of the Gundlabrahmeswaram wildlife sanctuary during October, 2013 to June, 2015. The ethnobotanicomedicinal plants information was documented from local tribals and traditional healers through direct approach, household surveys and semi-structured interviews. For the present study, the ethnobotanical data was collected from eighteen villages inside the sanctuary.

Results: Analysis of data revealed a total of 153 angiospermous plant taxa pertaining to 135 genera of 62 families utilized by the tribes for various common ailments. Fabaceae are the dominant family (22 taxa), followed by Apocynaceae (13), Malvaceae (10), Combretaceae and Rubiaceae (6 each), Convolvulaceae (5) and Acanthaceae, Amaranthaceae and Phyllanthaceae (4 each). Further, plant part-, disease- and habit-wise data of plant taxa are presented.

Conclusion: The study concludes with the need for further documentation of traditional botanical knowledge of the local inhabitants on one hand and conserving the sanctuary of its plant wealth from over exploitation and invasive weeds like *Hyptis suaveolens, Parthenium hysterophorus, Cyanthillium cinereum*, *Chromolaena odorata, Lantana* × *aculeata*, etc.

Keywords- Traditional knowledge, Inhabitants, Ethnomedicinal plants, Chenchus, Ailments.

INTRODUCTION

The utility of plants for human and veterinary health care is known since ancient times. As a report of all India Ethnobiological survey accomplished by Ministry of Environment and Forests (MoEF), Government of India, there are over and above 8000 plant species that are being used by the local people. About 1800 plant taxa are used in Ayurveda, 600 in Siddha, 400 each in Unani and Homeopathy Systems of medicine[1]. The traditional botanical knowledge of ethnic people and folklore, who live in and around the forests, is spread as word-of-mouth. There is a need to document this traditional knowledge before it is exterminate. It is established that the traditional knowledge is a source for the scientific groups to discover new drugs. Since long back, investigations have been conducted to know the traditional use and management of local flora of many regions. In recent times, the ethnobotanical research is incorporated in the current and emerging research trends for more utility of local people knowledge. It is expected that, in future, ethnobotany may play a vital role in biodiversity conservation and sustainable development[2]. India enjoys rich in ethnic and biological diversity. Nearly, 550 tribal communities pertaining to 227 ethnic groups inhabit the land. Andhra Pradesh is the home for 26 tribal communities. Of these, the major primitive, semi-nomadic tribal group is Chenchus, who live in groups of huts called *'gudem'* or *'penta'*. Plants and plant produce are the integral part of their day-to-day life. Most of the Chenchus still remain either hunters or Non-Timber Forest Product (NTFP) gatherers, and practice the barter system. The other tribes are Yerukulas and Lambadis (Sugalis). The latter group mainly depends on the forests for rearing cattle which results loss of valuable biological diversity. The important pre-requisite for proper utilization of raw materials of a country or state is the survey of its natural resources and the preparation of an inventory.

The forests of Andhra Pradesh have great potential from botanical wealth and ethnic economic points of view. Significant ethnobotanical explorations have been focused so far in the State. Conceivably, for the first time, Krishnamachari (1900) documented the use of leaves of *Erythroxylum monogynum* (devadari) and roots of *Aloe vera* (kalabanda) as food during paucity[3]. Hemadri (1976, 1981) reported the procurement of raw drug materials and tribal medicine for rheumatism[4,5]. Hemadri and Rao (1983, 1984) explored the plant taxa for leucorrhoea, menorrhagia and jaundice[6,7]. Rao and Sreeramulu (1985) documented 52 ethnomedicinal plants used by Savaras, Jatapus and Gadabas from Srikakulam district[8]. Ramarao (1988) documented the data on 'Ethnobotany of Eastern Ghats in Andhra Pradesh State' for his doctoral degree[9]. Reddy *et al*. (1991) collected information on 45 plant taxa in traditional system of medicine used by Yanadis, Yerukalas, Sugalis and Chenchus from Cuddapah district[10]. Rao and Prasad (1995) enlisted the ethnomedicine from Andhra Pradesh[11]. Reddy *et al*. (1996) documented the tribal medicine from Rutaceae[12]. Rajendran *et al*. (1996, 1997) provided the information on hepatic stimulant[13] and ichthyotonic plants[14] and Ramarao *et al*. (1999) reported a paper on phyto-zootherapy of the tribes[15]. Jeevan and Raju (2001) described certain potential crude drugs used by tribes of Nallamalai for skin diseases[16]. In 2005, Reddy and Subbaraju shortlisted the plants used as ethnomedicine from Maredumilli region[17] whereas Reddy *et al*. studied on the account of rheumatic diseases[18] and ethnobotany for certain orchids[19]. Reddy *et al*. (2006a-b) documented ethnoveterinary medicine for livestock and ethnobotanical uses for respiratory disorders[20,21]. In 2007,

Savithramma *et al*. reported the ethnobotanical plants used to treat asthma[22], Rao *et al*. enumerated the ethnomedicinal importance of Pteridophytes used by Chenchus of Nallamalais[23] while Jeevan *et al.* recorded some rare and little-known medicinal plants from Nallamalais[24], and Reddy *et al.* reported the traditional knowledge on wild food plants in the State[25]. Ratnam and Raju (2008a) enumerated the traditional medicine used by the adivasis of Eastern Ghats for bone fractures[26]. In 2011, Suneetha and Reddi documented the 600 ethnomedicinal plants to cure 147 different human complaints and mode of administration by Konda Reddis, Konda Doras, Koya Doras, etc. from East Godavari[27], Rao *et al*. enumerated the ethnomedicinal properties of 62 plant species pertaining to 61 genera of 43 families by Gadaba tribes of Visakhapatnam district[28] and Reddy *et al*. surveyed for ethnobotanical data from Sheshachalam hill ranges and documented 60 plant taxa of 33 families used by Sugali, Yerukala and Yanadi tribes[29]. Savithramma *et al*. (2012) enumerated 20 plant taxa of 20 families used as ethnomedicine by Yanadis for various common ailments[30]. Suneetha *et al*. (2013) reported ethnomedicinal plants as remedy for jaundice by the tribals of East Godavari district[31]. Recently, the documentation of ethnomedicinal knowledge from the hilly areas of East Godavari district was carried out by Raju *et al*. (2014) which resulting 90 medicinal plants of 45 families for 45 common human ailments[32] whereas Rao *et al*. (2014) wrote an obesvation on crude drugs in treatment of liver diseases by Chenchus in Nallamalais[33]. Swapna (2015) has explored 30 ethnobotanical plants pertaining to 20 families used by Yanadis of Kavali[34].

Conversely, the ethnobotanical research was carried out only from some regions of Andhra Pradesh. Due to the lack of specific baseline data available for Gundlabrahmeswaram wildlife sanctuary but for a report on folk remedies for insect bites[35]. The present study is an attempt to enumerate the ethnomedicinal plants used by the tribes in the sanctuary area.

Study area

The Gundlabrahmeswaram wildlife sanctuary (GWS) is abode of rich biodiversity with mixed deciduous forest and lies between latitudes 15°40′ to 15°89′N and longitudes 76°61′ to 78°09′E. It is situated in Gundlabrahmeswaram plateau of the central Nallamalais, often called 'Nucleus of Eastern Ghats'. It falls under the biotic province of 6E Deccan Peninsular-Deccan South and spreads over an area of 1194 sq km and located between two hills known as *Mantralamma Kanuma* and *Nandi Kanuma* in Kurnool and Prakasham districts of Andhra Pradesh. It is extended core area of the Nagarjunasagar-Srisailam Tiger Reserve (NSTR). The core areas of the Gundlabrahmeswaram and NSTR together constitute 3,730 sq km[35]. The terrain is undulating, interrupted with hillocks of igneous rocks, continuous range of unbroken rugged and steep hills with an average elevation of 600 m north to south. The river Gundlakamma passes through the sanctuary on its eastern side. The temperature ranges from 18°C (winter) and 45°C (summer). The flora includes a large number of endemics[36], rare, threatened or endangered categories[37]. The tribals live in their hamlets and largely depend on forest resources, honey collection, hunting, animal husbandry and *podu* cultivation. The sanctuary is the home for threatened, rare and endemic fauna including mammals, birds and reptiles and also some common existing fauna in the sanctuary are tiger, leopard, sloth bear, sambar, nilgai, jungle cat, wild dog, hyena, langur, chinkara, bonnet monkey, chowsingha, python, mouse deer, monitor lizard, etc.[38,39]

METHODOLOGY

Periodical field surveys were conducted in the ethnic villages of GWS during October, 2013 to June, 2015. The ethnobotanical information was gathered from the local tribals, traditional healers and practitioners of herbal medicine through direct approach, house hold surveys and semi-structured interviews. A total of 18 villages were covered in and around the sanctuary (13 *gudems* inhabited by *Chenchus* and 5 *mettas* or *villages* inhabited by *Yerukalas* and *Sugalis*) for the present study. Information was gathered from the informants with regard to vernaculars of medicinal plants, drug preparation and mode of administration. The voucher specimens of the plant taxa were collected for all the plants used by the ethnic tribes and they were identified with the help of Floras[40-42] and e–floras and the mounted specimens are deposited in Department of Botany, Government College, Nandyal (HND), for reference.

During our field visits, from each village/gudem a minimum of two informants (male and/or female) were included. A total of 56 key informants participated in the interviews and belong to 39-74 years of age (Table 1). Male informants (49; 87.5%) more actively participated over the female (07; 12.5%). The age group of informants was further categorized into five age-groups such as 30-39 (02; 3.57%), 40-49 (16; 28.57%), 50-59 (20; 35.71%), 60-69 (17; 30.36%) and 70-79 (01; 1.79%).

Enumeration

The botanical names were updated according to Angiosperm Phylogeny Group III (APG III) classification[43] and arranged alphabetically. The vernacular name of the species is followed by the scientific name, family, habit, part/s used and use-pattern (Table 2).

RESULTS AND DISCUSSION

The ethnomedicinal knowledge of the tribal communities is presented alphabetically by scientific name, family and local names, habit, plant part-use and ethnic potential applications. A total of 153 vascular plant taxa were documented pertaining to 135 genera of 62 families (Table 1). Of the species enlisted, the Fabaceae tops the list with 22 plant taxa, followed by Apocynaceae (13), Malvaceae (10), Combretaceae and Rubiaceae (6 each), Convolvulaceae (05) and Acanthaceae, Amaranthaceae and Phyllanthaceae (4 each). One species is used in case of 32 angiospermous families (Table 3).

Plant Growth-forms

The ethnomedicinal plants (Table 1) are analyzed for growth-form, *i.e.* as trees, shrubs, climbers and herbs. Of these, trees played a key role to heal common ailments and constituted a greater majority (53; 34.64%), followed by herbs (48; 31.37%), climbers (33; 21.57%) and shrubs (19; 12.42%) (Figure 1). The floristic composition reveals a *Phanero-therophytic* climate[44].

Part-wise utility

The plant crude drugs are obtained from the leaf and whole plant (26; 16.99% of each), followed by fruit (22; 14.38%), root and stem bark (18; 11.76% of each), seed (14; 9.15%), stem and tuber (6; 3.92% of each), rhizome (4; 2.61%), bulb and latex (3; 1.96% of each), bud, flower and gum (2; 1.31% of each) and wood (1; 0.65%) (Figure 2).

There are 12 species (Table 4) used to treat rheumatism, followed by dysentery (11), diarrhoea (10), skin disease (09) and diuretic (08) problems. As many as 67 potential uses are recorded with a species.

CONCLUSION

On the basis of availability of plants and use, the tribal communities collect the raw material of plants from the sanctuary. The collected medicinal plant parts were sold during festivals and conglomerations. Out of these, the most commonly and abundantly used medicinal plants are *Decalepis hamiltonii, Hemidesmus indicus, Asparagus racemosus* and *Andrographis paniculata*. The consumption of *Decalepis hamiltonii* and *Hemidesmus indicus* is very high during summer to prepare the drink from roots called *nannari* or *herbal cola*. *Andrographis paniculata* is extensively collected by the local traders and exported to pharmaceutical industries. The present study may provides a base for the pharmaceutical industries to discover new drugs to cure various diseases. There is a need to further document the traditional botanical knowledge (TBK) of the local inhabitants on one hand and attempt to conserve the native phytodiversity and take necessary action to control the intrusion of invasive alien species like *Hyptis suaveolens, Parthenium hysterophorus, Cyanthillium cinereum*, *Chromolaena odorata, Lantana* × *aculeata*, etc.

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Conflict of Interest

There is no conflict of interest for the publication.

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Table 1. Demographic information of tribal informants from 18 villages/gudems of Gundlabrahmeswaram wildlife sanctuary

S. No.	Range	Village/Gudem	No. of Informants	Age (in years)	Gender	Ethnicity	Occupation
1	Nandyal	Thimmapuram	4	62,55,50,40	M	Chenchu	Bamboo value addition
		Kalvagudem	3	65,58,61	M	Chenchu	Forest products/agricultural labour
		Mahanandi	2	65,62	M	Chenchu	Local vaidyas/honey collection
		Sugalimetta	2	45,48	M	Sugali	Agriculture/cattle raring
			1	45	F	Sugali	Agriculture/cattle raring
		Gadigudem	4	59,62,58,50	M	Chenchu	Forest produce/labour
			1	55	F	Chenchu	Forest produce/labour
		Baireni	4	39,45,68,68	M	Chenchu	Honey collection (wild)
2	Chalama	Chalama	2	48,65	M	Chenchu	Daily labour/bamboo collection
			1	60	F	Chenchu	Daily labour/bamboo collection
		Basavapuram	2	40,59	M	Chenchu	Forest produce/labour
		Gadigudem	2	48,50	M	Chenchu	Forest produce/labour
3	Bandiatmakur	Narapareddy kunta	1	58	M	Yerukala	Bamboo value addition
			2	40,42	F	Yerukala	Bamboo value addition
		Omkaram	2	49,62	M	Chenchu	Agricultural labour
		Yerukala colony	3	45,58,68	M	Yerukala	Bamboo value addition
		Palem	2	60,65	M	Yerukala	Daily labour/bamboo collection
		Naragudem	4	62,55,44,38	M	Chenchu	Honey collection
4	Gundlakamma	Diguvametta	2	50,56	M	Sugali	Agriculture/labour
		Isukagudem	3	49,59,62	M	Chenchu	Agricultural labour
		Malakonda penta	3	68,57,74	M	Chenchu	Forest produce/labour
			2	52,48	F	Chenchu	Forest produce/labour
		Ambavaram	4	47,54,58, 69	M	Chenchu	Daily labour/bamboo collection

M - Male; F - Female.

Table 2. List of plant taxa used by the ethnic people from Gundlabrahmeswaram wildlife sanctuary

S. No.	Local name	Scientific name	Family	Habit	Part used	Ethnic use
1	Kasturi benda	*Abelmoschus moschatus* Medik.	Malvaceae	H	Seed	Carminative
2	Gurivinda	*Abrus precatorius* L.	Fabaceae	C	Seed	Purgative, abortion
3	Tutturu benda	*Abutilon indicum* (L.) Sweet	Malvaceae	H	Seed	Bleeding piles, febrifuge
4	Sandra	*Acacia chundra* (Rottler) Willd.	Fabaceae	T	Fruit	Boils, ulcers
5	Kuppinta	*Acalypha indica* L.	Euphorbiaceae	H	Whole plant	Cough, bronchitis, asthma
6	Uttareni	*Achyranthes aspera* L.	Amaranthaceae	H	Whole plant	Tooth-ache, piles
7	Maredu	*Aegle marmelos* (L.) Corrêa	Rutaceae	T	Fruit	Diarrhoea, dysentery
8	Pindi kura	*Aerva lanata* (L.) Juss.	Amaranthaceae	H	Whole plant	Kidney stones, cough
9	Uduga	*Alangium salviifolium* (L.f.) Wangerin	Cornaceae	T	Root	Colic
10	Ponnaganti kura	*Alternanthera sessilis* (L.) R.Br. ex DC.	Amaranthaceae	H	Whole plant	Vegetable
11	Mulla thotakura	**Amaranthus spinosus* L.	Amaranthaceae	H	Whole plant	Vegetable
12	Nela vemu	*Andrographis paniculata* (Burm.f.) Nees	Acanthaceae	H	Whole plant	Fever, cough
13	Seethaphal	**Annona squamosa* L.	Annonaceae	T	Fruit	Cooling agent
14	Sirimanu	*Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guillem. & Perr.	Combretaceae	T	Stem bark	Insect bite
15	Nalleswari	*Aristolochia indica* L.	Aristolochiaceae	C	Root	Snake bite, tooth-ache
16	Pilli teegalu	*Asparagus racemosus* Willd.	Asparagaceae	C	Bulb	Rheumatism
17	Jala brahmi	*Bacopa monnieri* (L.) Wettst.	Plantaginaceae	H	Whole plant	Memory
18	Gare	*Balanites roxburghii* Planch.	Zygophyllaceae	S	Fruit	Ephemeral fever
19	Mulla gorinta	*Barleria prionitis* L.	Acanthaceae	S	Root	Antiseptic, febrifuge
20	Are	*Bauhinia racemosa* Lam.	Fabaceae	T	Leaf	Malaria, anthelmintic
21	Addaku	*Bauhinia vahlii* Wight & Arn.	Fabaceae	C	Leaf	Meal plates making
22	Deva kanchanam	*Bauhinia purpurea* L.	Fabaceae	T	Bud	Dysentery, diarrhoea
23	Attipatti	*Biophytum sensitivum* (L.) DC.	Oxalidaceae	H	Whole plant	Gonorrhoea, lithiasis
24	Atika mamidi	*Boerhavia diffusa* L.	Nyctaginaceae	H	Whole plant	Diuretic, asthma
25	Buruga	*Bombax ceiba* L.	Malvaceae	T	Stem bark	Wound healing, dysentery
26	Guggilam, anduga	*Boswellia serrata* Roxb. ex Colebr.	Burseraceae	T	Stem bark	Skin diseases, diarrhoea
27	Sara pappu	*Buchanania cochinchinensis* (Lour.) M.R.Almeida	Anacardiaceae	T	Leaf	Treating leprosy
28	Moduga	*Butea monosperma* (Lam.) Taub.	Fabaceae	T	Seed	Anthelmintic
29	Gacha kaya	*Caesalpinia bonduc* (L.) Roxb.	Fabaceae	C	Seed	Antipyretic, snake bite
30	Pemu bettam	*Calamus rotang* L.	Arecaceae	S	Stem	Cough, bronchitis
31	Jilledu	**Calotropis gigantea* (L.) Dryand.	Apocynaceae	S	Latex	Rheumatism
32	Adonda	*Capparis zeylanica* L.	Capparaceae	C	Fruit	Diabetes
33	Budda budama	**Cardiospermum halicacabum*	Sapindaceae	H	Whole plant	Diuretic, rubefacient

		L.				
34	Kumbhi	*Careya arborea* Roxb.	Lecythidaceae	T	Stem bark	Cough, cold, antipyretic
35	Waka	*Carissa carandas* L.	Apocynaceae	S	Fruit	Cooling agent, anthelmintic
36	Rela	*Cassia fistula* L.	Fabaceae	T	Stem bark	Dysentery, jaundice, astringent
37	Maner teega	*Celastrus paniculatus* Willd.	Celastraceae	S	Seed	Scabies, rheumatism
38	Saraswati aku	*Centella asiatica* (L.) Urb.	Apiaceae	H	Whole plant	Memory; skin diseases
39	Reddivari nanubalu	*Chamaesyce hirta* (L.) Millsp.	Euphorbiaceae	H	Whole plant	Jaundice, diuretic, aphrodisiac
40	Chengalva kostu	*Cheilocostus speciosus* (J.Keonig) C.D.Specht	Costaceae	H	Rhizome	Aphrodisiac, snake bite
41	Sarala pagada	*Chlorophytum arundinaceum* Baker	Asparagaceae	H	Tuber	Rejuvinator, rheumatism
42	Billudu	*Chloroxylon swietenia* DC.	Rutaceae	T	Leaf	Mosquito repellent
43	Nalleru	*Cissus quadrangularis* L.	Vitaceae	C	Stem	Bone fracture
44	Adavi draksha	*Cissus vitiginea* L.	Vitaceae	S	Stem	Bone fracture, bronchitis
45	Kodisha	*Cleistanthus collinus* (Roxb.) Benth. ex Hook.f.	Phyllanthaceae	T	Stem bark	Piscicidal
46	Dusari teega	*Cocculus hirsutus* (L.) W.Theob.	Menispermaceae	C	Root	Rheumatism
47	Konda gogu	*Cochlospermum religiosum* (L.) Alston	Bixaceae	T	Stem bark	Sedative
48	Yedla teega	*Combretum ovalifolium* Roxb.	Combretaceae	C	Stem	Basket making
49	Venne veduru	*Commelina benghalensis* L.	Commelinaceae	H	Whole plant	Cough, inflammation
50	Banka nakkari	*Cordia dichotoma* G.Forst.	Boraginaceae	T	Fruit	Diuretic, demulcent
51	Vrishakarni	*Crinum latifolium* L.	Amaryllidaceae	H	Bulb	Stomach-ache
52	Chinna giligichha	*Crotalaria retusa* L.	Fabaceae	H	Whole plant	Scabies, impetigo
53	Giligichha	*Crotalaria verrucosa* L.	Fabaceae	H	Leaf	Scabies
54	Adavi palateega	*Cryptolepis dubia* (Burm.f.) M.R.Almeida	Apocynaceae	C	Root	Stomach-ache
55	Nela thatigaddalu	*Curculigo orchioides* Gaertn.	Hypoxidaceae	H	Tuber	Aphrodisiac, piles, jaundice
56	Adavi pasupu	*Curcuma pseudomontana* J.Graham	Zingiberaceae	H	Rhizome	Muscle pain, leprosy, debility
57	Seethamma savaralu	*Cuscuta reflexa* Roxb.	Convolvulaceae	C	Stem	Liver disorders
58	Rusa grass	*Cymbopogon martini* (Roxb.) W.Watson	Poaceae	H	Leaf	Skin diseases
59	Garika	**Cynodon dactylon* (L.) Pers.	Poaceae	H	Leaf	Diuretic
60	Tunga	*Cyperus rotundus* L.	Cyperaceae	H	Tuber	Ephemeral fever
61	Jitregi	*Dalbergia latifoloa* Roxb.	Fabaceae	T	Stem bark	Diarrhoea, dysentery
62	Nannari	*Decalepis hamiltonii* Wight & Arn.	Apocynaceae	C	Root	Appetizer, blood purifier
63	Badanika	*Dendrophthoe falcata* (L.f.) Ettingsh.	Loranthaceae	H	Whole plant	Menstrual disorders
64	Gitanaram	*Desmodium gangeticum* (L.) DC.	Fabaceae	H	Root	Anti-inflammatory, aphrodisiac, analgesic

65	Veluturu	*Dichrostachys cinerea* (L.) Wight & Arn.	Fabaceae	S	Stem bark	Ophthalmic disorders
66	Chebeera	*Dicliptera paniculata* (Forssk.) I.Darbysh.	Acanthaceae	C	Whole plant	Snake bite
67	Adavi dumpa	*Dioscorea bulbifera* L.	Dioscoreaceae	C	Tuber	Dysentery, astringent
68	Duke pendalam	*Dioscorea pentaphylla* L.	Dioscoreaceae	C	Tuber	Swelling
69	Beedi aku	*Diospyros melanoxylon* Roxb.	Ebenaceae	T	Leaf	Beedi making
70	Yella gonad	*Diospyros montana* Roxb.	Ebenaceae	T	Fruit	Stimulative, diuretic, laxative
71	Bandaru	*Dodonaea viscosa* (L.) Jacq.	Sapindaceae	S	Leaf	Bone fracture, rheumatism
72	Oddi	*Dolichandrone falcata* (Wall. ex DC.) Seem.	Bignoniaceae	T	Stem bark	Fever, fish poison
73	Dudipala	*Dregea volubilis* (L.f.) Benth. ex Hook.f.	Apocynaceae	C	Leaf	Rheumatism, snake bite
74	Adavi ulli	*Drimia indica* (Roxb.) Jessop.	Asparagaceae	H	Bulb	Cough, bronchitis
75	Mulla banthi	**Echinops echinatus* Roxb.	Asteraceae	H	Root	Sexual debility
76	Katuka aku	**Eclipta prostrata* (L.) L.	Asteraceae	H	Leaf	Hair tonic
77	Tella juvvi	*Ehretia laevis* Roxb.	Boraginaceae	T	Fruit	Eczema, aphrodisiac
78	Nelagolimidi	*Enicostema axillare* (Poir. ex Lam.) A.Raynal	Gentianaceae	H	Whole plant	Diabetes
79	Gilla teega	*Entada rheedii* Spreng.	Fabaceae	C	Seed	Rheumatism, emetic, anthelmintic
80	Baditha	*Erythrina variegata* L.	Fabaceae	T	Stem bark	Menstrual disorders, asthma, diarrhoea
81	Vishnu krantamu	*Evolvulus alsinoides* (L.) L.	Convolvulaceae	H	Whole plant	Tonic, febrifuge
82	Kaki medi	*Ficus hispida* L.f.	Moraceae	T	Latex	Skin diseases
83	Medi	*Ficus recemosa* L.	Moraceae	T	Latex	Antiseptic, leucoderma
84	Tabsi	*Firmiana simplex* (L.) W.Wight	Malvaceae	T	Gum	Cooling agent, thickening
85	Bikki	*Gardenia gummifera* L.f.	Rubiaceae	T	Fruit	Anti-spasmodic
86	Karinga	*Gardenia resinifera* Roth	Rubiaceae	T	Bud	Skin disease
87	Bonta teega	*Getonia floribunda* Roxb.	Combretaceae	C	Leaf	Anthelmintic
88	Nabhi	*Gloriosa superba* L.	Colchicaceae	C	Tuber	Abortifacient, neurologic pains
89	Gummadi teku	*Gmelina arborea* Roxb.	Lamiaceae	T	Stem bark	Laxative, stomach-ache
90	Jana	*Grewia tiliifolia* Vahl	Malvaceae	S	Fruit	Dysentery, astringent
91	Poda patri	*Gymnema sylvestre* (Retz.) R.Br. ex Sm.	Apocynaceae	C	Leaf	Diabetes
92	Nulthada	*Helicteres isora* L.	Malvaceae	S	Fruit	Expectorant, astringent
93	Sugandhi pala	*Hemidesmus indicus* (L.) R.Br. ex Schult.	Apocynaceae	C	Root	Antiviral, antibacterial
94	Barrisugandhi pala	*Hemidesmus indicus* var. *pubescens* Hook.f.	Apocynaceae	C	Root	Diuretic, demulcent
95	Pala kodisa	*Holarrhena pubescens* Wall. ex G.Don	Apocynaceae	T	Fruit	Anthelmintic, carminative
96	Nemali nara	*Holoptelea integrifolia* Planch.	Ulmaceae	T	Stem bark	Haemorrhoids
97	Ratna purusha	*Hybanthus enneaspermus* (L.) F.Muell	Violaceae	H	Whole plant	Aphrodisiac

98	Neeru gobbi	*Hygrophila auriculata* (Schum) Heine	Acanthaceae	H	Leaf	Rheumatism
99	Darba gaddi	*Imperata cylindrica* (L.) Raeusch.	Poaceae	H	Whole plant	Dysentery, diarrhoea
100	Golla jiddaku	*Ipomoea obscura* (L.) Ker Gawl.	Convolvulaceae	C	Leaf	Stomach-ache
101	Kasi ratnam	*Ipomoea quamoclit* L.	Convolvulaceae	C	Whole plant	Hemorrhoids
102	Gumpena	*Lannea coromandelica* (Houtt.) Merr.	Anacardiaceae	T	Stem bark	Astringent, tooth-ache
103	Gaju kampa	**Lantana × aculeata* L.	Verbenaceae	S	Leaf	Anti-malarial
104	Ankadosa	*Leea indica* (Burm.f.) Merr.	Vitaceae	S	Root	Bone fracture
105	Mukkuthummudu teega	*Leptadenia reticulata* (Retz.) Wight & Arn.	Apocynaceae	C	Whole plant	Aphrodisiac
106	Thummi	*Leucas aspera* (Willd.) Link.	Lamiaceae	H	Leaf	Head-ache
107	Velaga	*Limonia acidissima* Groff	Rutaceae	T	Fruit	Dysentery, jaundice, astringent
108	Dayyapu jeda	*Lygodium flexuosum* (L.) Sw.	Lygodiaceae	C	Rhizome	Rheumatism, scabies
109	Ippa	*Madhuca longifolia* var. *latifolia* (Roxb.) A.Chev.	Sapotaceae	T	Flower	Distillation spirit (ippa sara)
110	Pala	*Manilkara hexandra* (Roxb.) Dubard	Sapotaceae	T	Fruit	Fever, dyspepsia
111	Batta ganapu	*Mitragyna parvifolia* (Roxb.) Korth.	Rubiaceae	T	Stem bark	Skin disease, wounds healing
112	Togari	*Morinda pubescens* Sm.	Rubiaceae	T	Root	Gout, dysentery
113	Dula gondi	*Mucuna pruriens* (L.) DC.	Fabaceae	C	Seed	Vermifuse to cattle
114	Turka toppe	*Olax scandens* Roxb.	Olacaceae	S	Leaf	Diarrhoea
115	Naga dundilum	*Oroxylum indicum* (L.) Kurz	Bignoniaceae	T	Root	Diarrhoea, dysentery
116	Papidi	*Pavetta indica* L.	Rubiaceae	S	Root	Jaundice
117	Juttupaaku	*Pergularia daemia* (Forssk.) Chiov.	Apocynaceae	C	Leaf	Menstrual disorders, snake bite
118	Nela usiri	**Phyllanthus amarus* Schumach. & Thonn.	Phyllanthaceae	H	Leaf	Jaundice
119	Usiri	*Phyllanthus emblica* L.	Phyllanthaceae	T	Fruit	Pickled
120	Nalla usirika	*Phyllanthus maderaspatensis* L.	Phyllanthaceae	H	Seed	Laxative, diuretic
121	Teega velaga	*Phyllodium pulchellum* (L.) Desv.	Fabaceae	S	Whole plant	Diarrhoea, haemorrhage
122	Budama	**Physalis angulata* L.	Solanaceae	H	Fruit	Purgative
123	Tella chitramulam	*Plumbago zeylanica* L.	Plumbaginaceae	H	Root	Piles, nervous system
124	Kanuga	*Pongamia pinnata* (L.) Pierre	Fabaceae	T	Seed	Antibacterial, insecticidal
125	Balusu	*Psydrax dicoccos* Gaertn.	Rubiaceae	S	Stem	Combs
126	Yegisa	*Pterocarpus marsupium* Roxb.	Fabaceae	T	Gum	Diabetes, diarrhoea
127	Nela gummadi	*Pueraria tuberosa* DC.	Fabaceae	C	Tuber	Cold, rheumatism
128	Boddi	*Rivea hypocrateriformis* Choisy	Convolvulaceae	C	Root	Snake bite
129	Kusuma	*Schleichera oleosa* (Lour.) Merr.	Sapindaceae	T	Fruit	Astringent
130	Nalla jeedi	*Semecarpus anacardium* L.	Anacardiaceae	T	Seed	Magico-religious beliefs

131	Tangedu	**Senna auriculata* (L.) Roxb.	Fabaceae	S	Leaf	Scorpion bite
132	Bala	**Sida acuta* Burm.f	Malvaceae	H	Leaf	Skin disease
133	Gayapaku	*Sida cordata* (Burm.f.) Borss.Waalk.	Malvaceae	H	Seed	Urinary disorders
134	Somi	*Soymida febrifuga* (Roxb.) A.Juss.	Meliaceae	T	Stem bark	Fibre
135	Mushti	*Strychnos nux-vomica* L.	Loganiaceae	T	Seed	Paralysis
136	Chilla	*Strychnos potatorum* L.f.	Loganiaceae	T	Seed	Water purification
137	Neredu	*Syzygium cumini* (L.) Skeels	Myrtaceae	T	Fruit	Diabetes
138	Tella maddi	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	Combretaceae	T	Stem bark	Diabetes, cardiac tonic
139	Thani	*Terminalia bellirica* (Geartn.) Roxb.	Combretaceae	T	Fruit	Purgative, stomach-ache
140	Karaka	*Terminalia chebula* Retz.	Combretaceae	T	Fruit	Laxative
141	Tippa teega	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	C	Leaf	Diabetes
142	Galijeru	**Trianthema portulacastrum* L.	Aizoaceae	H	Whole plant	Stomach-ache
143	Mekameyani aku	*Tylophora indica* (Burm.f.) Merr.	Apocynaceae	C	Leaf	Asthma, whooping cough
144	Badanika	*Vanda spathulata* (L.) Spreng.	Orchidaceae	H	Whole plant	Asthma
145	Badanika	*Vanda tesellata* (Roxb.) Hooks.	Orchidaceae	H	Whole plant	Evil spirit, rheumatism
146	Nalla benda	**Waltheria indica* L.	Malvaceae	H	Root	Wound healing
147	Jaji	*Woodfordia fruticosa* (L.) Kurz	Lythraceae	S	Flower	Diarrhoea
148	Ankudu	*Wrightia arborea* (Dennst.) Mabb.	Apocynaceae	T	Wood	Toy making
149	Bojja	*Xylia xylocarpa* (Roxb.) Taub.	Fabaceae	T	Stem bark	Skin disease
150	Galijeru	**Zaleya decandra* (L.) Burm.f.	Aizoaceae	H	Leaf	Jaundice
151	Adavi allam	*Zingiber roseum* (Roxb.) Roscoe	Zingiberaceae	H	Rhizome	Condiment, tumours
152	Pariki	*Ziziphus oenopolia* (L.) Mill.	Rhamnaceae	C	Fruit	Dyspepsia
153	Gotti	*Ziziphus xylopyrus* (Retz.) Willd.	Rhamnaceae	T	Leaf	Skin disease

T=Tree; S=Shrub; C=Climber; H=Herb; *=Exotic.

Table 3. Family-wise contribution of ethnomedicinal plant species

Rank	No. of species	No. of families	Family/Families
1	22	1	Fabaceae
2	13	1	Apocynaceae
3	10	1	Malvaceae
4	12	2	Combretaceae and Rubiaceae
5	5	1	Convolvulaceae
6	12	3	Acanthaceae, Amaranthaceae and Phyllanthaceae
7	18	6	Anacardiaceae, Asparagaceae, Poaceae, Rutaceae, Sapindaceae and Vitaceae
8	30	15	Aizoaceae, Asteraceae, Bignoniaceae, Boraginaceae, Dioscoreaceae, Ebenaceae, Euphorbiaceae, Lamiaceae, Loganiaceae, Menispermaceae, Moraceae, Orchidaceae, Rhamnaceae, Sapotaceae and Zingiberaceae
9	32	32	Amaryllidaceae, Annonaceae, Apiaceae, Arecaceae, Aristolochiaceae, Bixaceae, Burseraceae, Capparaceae, Celastraceae, Colchicaceae, Commelinaceae, Cornaceae, Costaceae, Cyperaceae, Gentianaceae, Hypoxidaceae, Lecythidaceae, Loranthaceae, Lygodiaceae, Lythraceae, Meliaceae, Myrtaceae, Nyctaginaceae, Olacaceae, Oxalidaceae, Plantaginaceae, Plumbaginaceae, Solanaceae, Ulmaceae, Verbenaceae, Violaceae and Zygophyllaceae

Table 4. Top five diseases/disorders and the number of species used to treat the inhabitants of GWS

S. No.	Disease/disorder	No. of plant species
1	Rheumatism	12
2	Dysentery	11
3	Diarrhoea	10
4	Skin disease	09
5	Diuretic	08

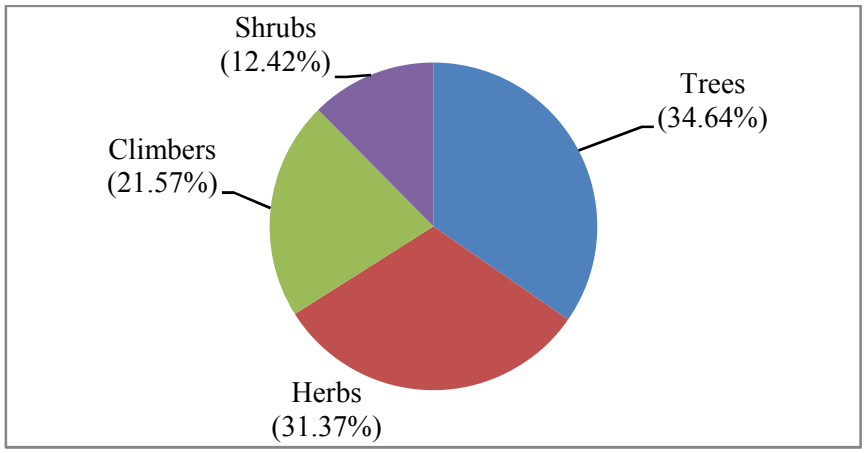

Figure 1: Proportions of growth-forms of ethnomedicinal plants of GWS

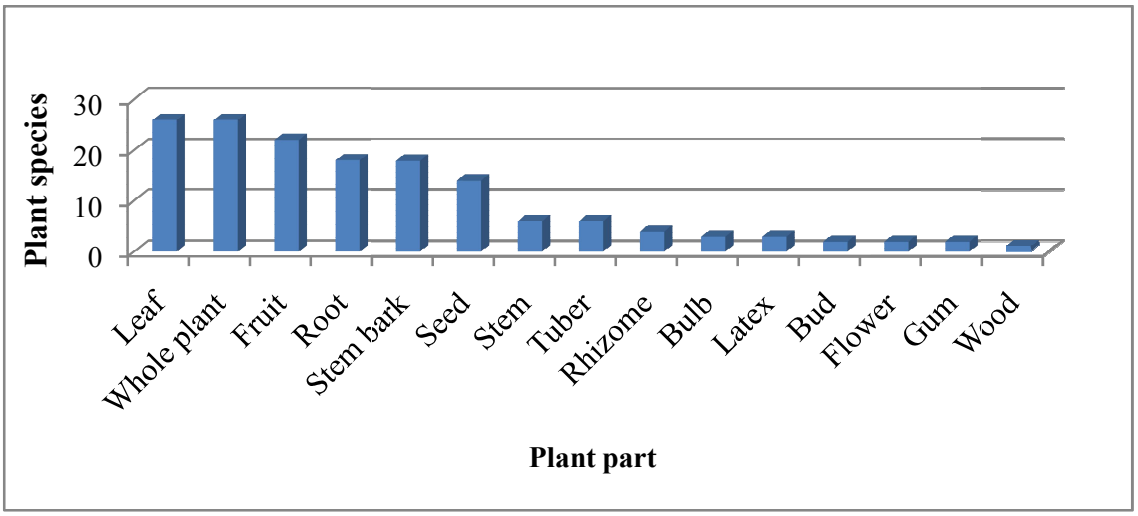

Figure 2: Plant part-wise ethnic utility of species