

## SURVEY OF ETHNOMEDICINAL PLANTS IN KALRAYAN HILLS, EASTERN GHATS, VILLUPURAM DISTRICT, TAMIL NADU

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### ABSTRACT

The present survey deals with the indigenous knowledge on medicinal plants found in Kalrayan hills, Villupuram district, Tamil Nadu. A maximum of 60 ethnomedicinally important plants belonging to 36 different families were collected, herborized and identified. Ethnobotanical information included the local name of the particular plant, parts utilized, medicinal uses and methods of preparation and administration. Among the various plant parts, leaves (32%) were found to be highly used for medicinal preparation. Medicines were prepared in the form of paste, powder, decoction, juice, infusion and also in crude form, with other additives like honey, curd, and urine and cow milk to get relief from different ailments like diabetes, inflammations, wounds, skin diseases, headache, indigestion, urinary infections, fever, snake bites, cough, and dental problems. This study therefore concludes that suitable requirements are needed in order to protect the traditional knowledge in a particular area with reference to medicinal plant utilization. The plants need to be evaluated through phytochemical investigation to discover potentiality as drugs.

**KEYWORDS:** Medicinal plants, Kalrayan hills, indigenous knowledge, *in situ*, ailments.

### INTRODUCTION

Human beings from the very beginning of its appearance on this earth has been indispensably associated with the plant kingdom for its survival. Traditional herbal medicine is an important component of human healthcare world-wide. It is estimated that 66–85 % of the world's population depends directly on plants as medicines. Since the existence of human civilization, plants and their by-products have been used by a large proportion of the population living in rural and urban areas for various purposes such as medicine, healthcare, food, clothing, shelter, agriculture, agrochemicals, pharmaceuticals, narcotics, etc. (Lifongo *et al.*, 2014). The reliance of people on ethnomedicine has been for reasons of cost-effectiveness, acceptability, biomedical benefits and accessibility. The World Health Organization (WHO) estimated that 80% of the developing world relies on the traditional medicines and in which 85% use plants or their extracts as active substances as plant drugs for their primary healthcare needs. In recent years, use of ethnobotanical information in medicinal plant research has gained considerable attention in segments of the scientific community (Morvin Yabesh *et al.*, 2014). There has been a continuous growth of demand for herbal medicines globally. The demand has been increasing as a result of growth of human population,

habitat loss and alteration, over exploitation, overgrazing, deforestation and the frequently inadequate provision of modern medicine.

India is one of the most medico-culturally diverse countries in the world where the medicinal plant sector is part of a time honored tradition that is respected even today. India is one of the 12-mega biodiversity centres in the country with two hotspots of biodiversity Viz., Western Ghats and Eastern Himalayas. The country possesses an ancient system of healthcare, chiefly based on medicinal plants of diverse nature ranging from higher plants to microorganisms from which more than 80% of therapeutic products are derived and have been used for 6000–7000 years (Balakrishnan *et al.*, 2009). India is regarded as the treasure trove of herbs in the world. It is also a country with the strongest traditions of nature conservation anywhere in the world. Chinese, Indian, Arabian and other traditional systems of medicines make extensive use of about 5000 plants. Different stakeholders in the medicinal plants sector have projected Tamil Nadu, one of the Southern states, as an "Herbal" state. The knowledge of medicinal plants has been accumulated in the course of many centuries based on different medical systems such as Ayurveda, Unani and Siddha (Bopana and Saxena, 2007). Ethnobotanical

investigation has led to the documentation of a large number of wild plants used by tribal for meeting their multifarious requirements. Studies on ethnobotany were initiated by Janaki-Ammal as an official programme in the Economic Botany Section of Botanical Survey of India (Howrah) in 1954. From 1960, Jain started intensive field studies among tribal areas of central India (Jain, 1964; 1989). These publications triggered ethnobotanical activities in many botanists, anthropologists and ayurvedic medical practitioners. In the recent years, number of reports on the use of plants in traditional healing by either tribal people or indigenous communities of India particularly Eastern Ghats of Tamil Nadu is increasing.

The extent of Eastern Ghats in Tamil Nadu begins close to the border of Andhra Pradesh and ends near Cauvery river and cover an area of 13678 km<sup>2</sup> (10.5% of total geographic area in Tamil Nadu). Javadi, Elagiri, Chitteri, Shervarayan, Bodamalai, Kolli, Pacchaimalai and Kalrayan are the major hill ranges. These hills are bearing the brunt of severe denudation over the centuries due to its easy accessibility and low elevations compared to the Western Ghats. The biodiversity was intact in the past but in due course anthropogenic pressure has resulted in the fragmentation of the primary forest patches. The pressure is ever increasing due to the rise in population and intensity of grazing and shifting cultivation as is evident on the degrading slopes. This situation is enhanced by the regular forest fires (one of the abiotic hazards) and is converting most of the good forests into grasslands.

Documentation of traditional therapeutic knowhow could lead to the discovery of new drugs as well as contribute to the conservation, sustainable management and use of plant resources, therefore, it is very crucial that ethnobiological surveys be carried out for the preservation of these indigenous knowledge. However, knowledge on the use of medicinal plants is enormous but if this is not rapidly researched and recorded, indications is that it will be lost with succeeding generations. In order to preserve traditional medicinal knowledge, it is necessary that inventories of plants with therapeutic value are carried out and the knowledge related to their use is documented in systematic studies. These studies can have other values too for society besides conserving traditional knowledge, for they can help to identify plants with market potential that can generate incomes for local communities. Again, ethnobiological surveys provide the rationale for selection and scientific investigation of medicinal plants and animals, since some of these indigenous remedies have successfully been used by significant numbers of people over extended periods of time. Documentation of this vast indigenous traditional medicine knowledge is important for preserving the indigenous knowledge,

cultural values and knowledge of medicinal plants and is the bedrock for further pharmacological research, bioprospecting and drug discovery (Borokini *et al.*, 2013). In view of the aforesaid facts, the present study was focused on surveying and documenting the traditional medicinal plants used for managing different ailments in Kalrayan hills, Eastern Ghats, Tamil Nadu.

## MATERIALS AND METHODS

### Study area

The study area, the Kalrayan hills, part of Eastern Ghats, lies between the north latitudes 11° 36" and 12° 01" N and the east longitudes 78° 29" and 78° 54" E. It covers a total area of around 75,000 sq. km. The elevation of the hills ranges between 760 m - 1370 m above mean sea level. The Kalrayan hills are a major range of hills situated in the Eastern Ghats of southern Indian state of Tamil Nadu (Fig. 1). It forms part of three districts viz. Salem (southern and south western portion), Villupuram (central and eastern portion) and a small pocket in the northern most part of the study area forms part of Thiruvannamalai district and covers an area about 1158.4 km<sup>2</sup>. Locally, the Kalrayan hills is divided into "5" nadus (clusters of villages), such as Periyakalrayan (western part), Chinnakalrayan (northern part), Jadaya gaundan (southern and eastern part), Kurumba gaundan (central part) and Ariya gaundan (north). The total population is 52,165 of which 92.88% are scheduled tribes and scheduled castes. Pappanaickanpatti is the foot hill of Kalrayan hills. Karumanthurai is the main place of Kalrayan hills. The distance between Pappanaickanpatti to Karumanthurai is 11 km. The study area encompasses 79 revenue villages. It acts as catchment for Gomukhi, Kariakovil and Manimuktha rivers. It supports life to more than 1 lakh people those who have been living in and around the Kalrayan hills. The hill also possess innumerable tourism potentialities like Periyar and Kaviyam waterfalls, jungle streams, Kariakovil and Gomukhi dam, rivers and rivulets and lovely jungle walks. It is also called as Poor man's hill station of Tamil Nadu. Of the total geographical area, forest land accounts for about 42.04% while the total cropped area of this hill is 173223.05 ha, this is nearly 21.25% of the total geographical area. It enjoys a mild tropical climate with a mean annual rainfall of about 860 mm. The major share of rainfall is obtained during north east monsoon period especially in the months of October and November. The temperature varies from a minimum of 25°C to a maximum of 40°C. The altitude varies from 126 to 1298 m. The study area is composed of seven soil types and varies from red-loam to black clay. The soil pH is 6.5-7.5. The soil in the hill is reddish brown to dark red, shallow to moderately deep, fine loamy, non - calcareous, excessively drained and subjected the severe erosion and run off.

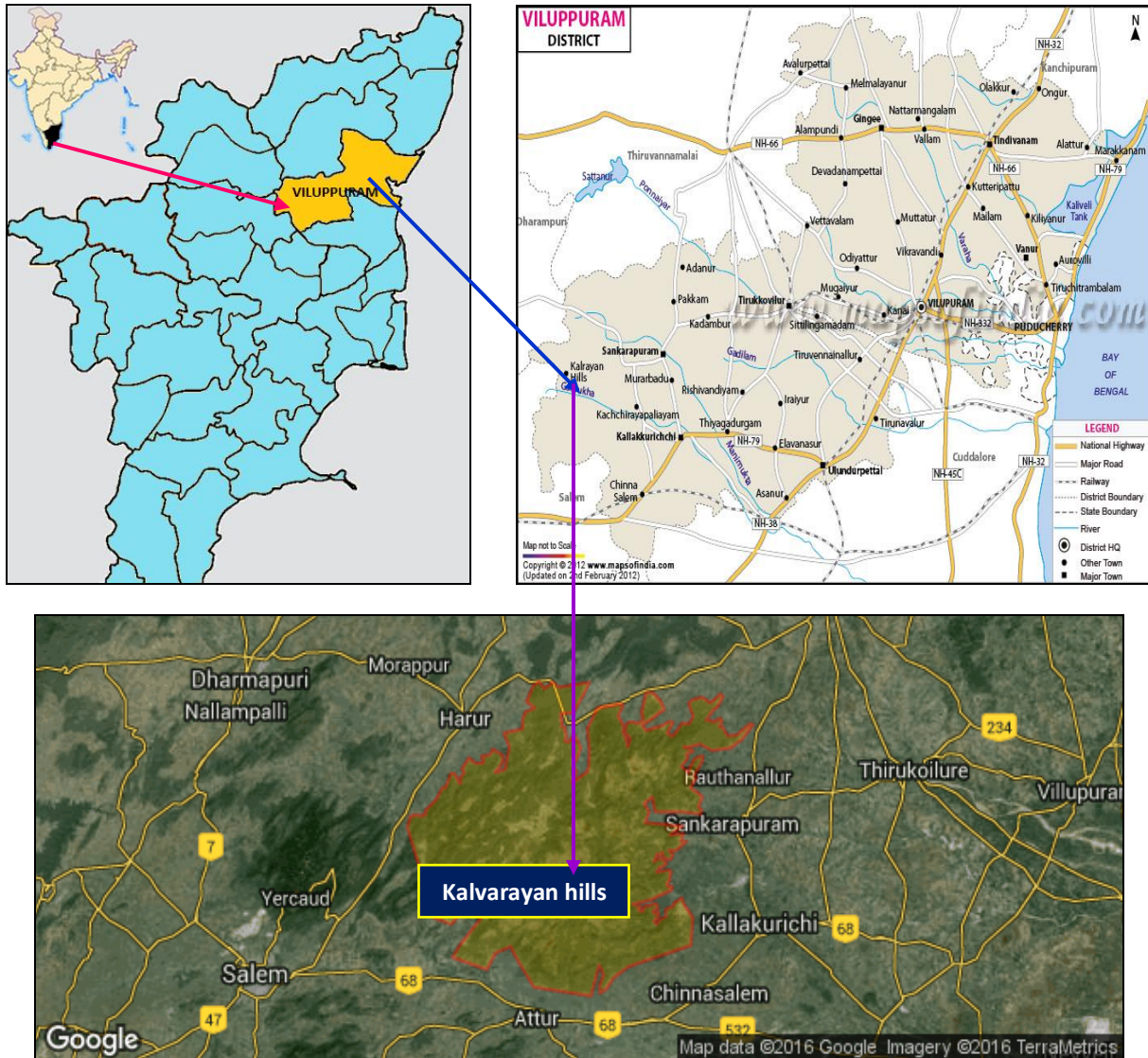


Fig. 1: Map of Kalrayan hills, Villupuram District, Tamil Nadu.

### Methodology

The ethnobotanical study was conducted in Kalrayan hills of Eastern Ghats for a period of four months, October 2015 to January 2016 (Fig. 1). The interviews were conducted in the local language, Tamil and specific question based proforma were designed and information were recorded in the ethnobotanical field notebook. Ethnobotanical information included the local name of the particular plant, parts utilized, medicinal uses and methods of preparation and administration. All the species cited as medicinal plants were collected from the field at reproductive stage, with the help of informants in duplicate. A field sheet was recorded with collectors name, vernacular name, local name and ecological parameters. Information was gathered from all categories of village people such as the local healers, village head man, elderly persons and the person having a thorough knowledge of medicinal practices. Canon PC1474 camera with 12.1 Mega pixels, 4X Optical Zoom, Canon Inc., Malaysia was used for taking photographs.

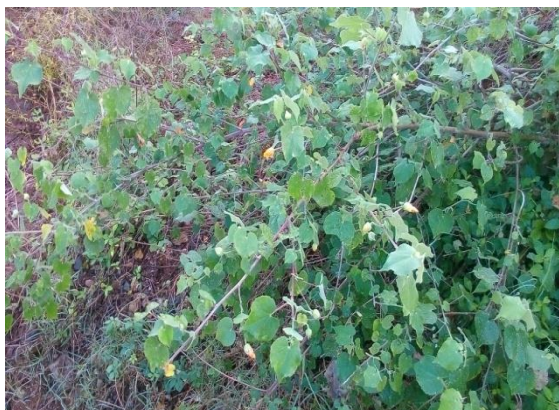
### Herborization

The plant specimen were freshly collected and arranged properly within the folded sheets of pressing papers (12''/18''), each of which was placed between two dry blotters of same size to make the herbariums. The whole piles of blotters and pressing sheets was then locked up in a field press for 24 hours. Since drying of plants was done without heat, it needed five changes of blotters and pressing sheets properly spread over a span of 12 days. Each specimen was mounted on a white card sheet (11.5''/16.5'') by using white gum paste (Khare, 2007; Chopra *et al.*, 1956). The information's collected regarding the medicinal uses of plants were analyzed properly and documented. The plants were identified taxonomically using the Flora of the Presidency of Madras (Gamble, 1935), Flora of Tamil Nadu (Nair and Henry, 1983) and Flora of Tamil Nadu Carnatic (Matthew, 1983).

**RESULTS AND DISCUSSION**

In the present study, the data regarding the indigenous medicinal practices using local plants available in Kalrayan hills were collected by interviewing tribal villagers of Kalrayan hills, Villupuram District, Tamil Nadu, India. The common medicinal plants were

surveyed in the study area and tabulated (Table 1 and Fig. 2). In the present study, 60 species of plants including 57 genera and 36 families were recorded which are being exploited by the tribal group in different human ailments.



1. *Abutilon indicum*



2. *Aerva lanata*



3. *Acalypha indica*



4. *Achyranthes aspera*



5. *Agave sisalana*



6. *Alangium salvifolium*



7. *Aloe barbadensis*



8. *Anogeissus latifolia*



9. *Azadirachta indica*



10. *B. bambos*



11. *Bauhinia purpurea*



12. *Cardiospermum halicacabum*



13. *Carissa carandas*



14. *Cassia auriculata*



15. *Catharanthus roseus*



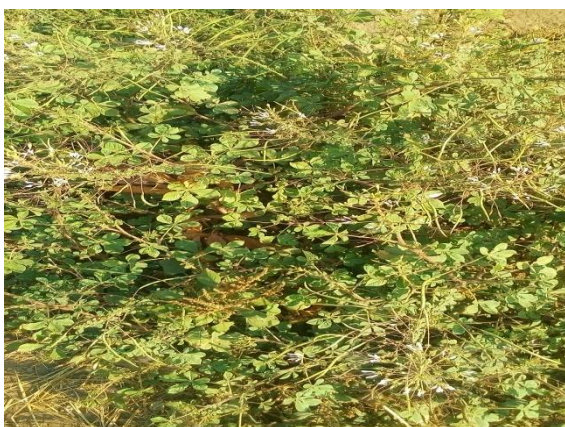
16. *Chloris virgata*



17. *Cissus quadrangularis*



18. *Cleistanthus collinus*



19. *Cleome gynandra*



20. *Cocos nucifera*



21. *Cynodon dactylon*



22. *Cyperus rotundus*



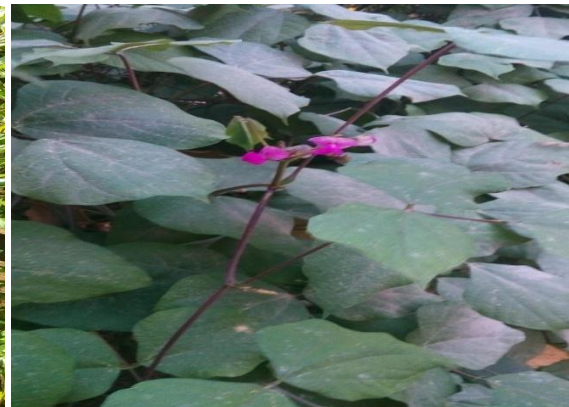
23. *Delonix elata*



24. *Crotalaria verrucosa*



25. *Dodonaea viscosa*



26. *Dolichos lablab*



27. *Mitracarpus villosus*



28. *Eragrostis bifaria*



29. *Evolvulus alsinoides*



30. *Gloriosa superba*



31. *Grewia hirsuta*



32. *Hemidesmus indicus*



33. *Indoneesiella echioides*



34. *Lantana camara*



35. *Launea sarmentosa*



36. *Lawsonia inermis*



37. *Leucas aspera*



38. *Leonotis nepetifolia*





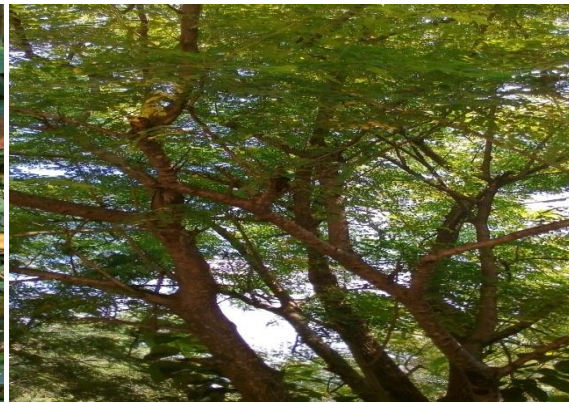
39. *Mangifera indica*



40. *Corchorus*



41. *Mimosa pudica*



42. *Moringa concanensis*



43. *Mollugo cerviana*



44. *Murraya koenigii*



45. *Ocimum tenuiflorum*



46. *Oryza sativa*



47. *Passiflora edulis*



48. *Pavonia zeylanica*



49. *Phyllanthus emblica*



50. *Phyllanthus amarus*



51. *Rauvolfia serpentina*



52. *Sansevieria roxburghiana*



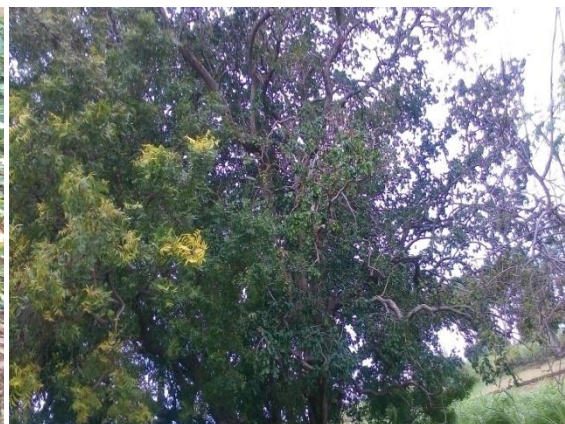
53. *Santalum album*



54. *Solanum nigrum*



55. *Solanum trilobatum*



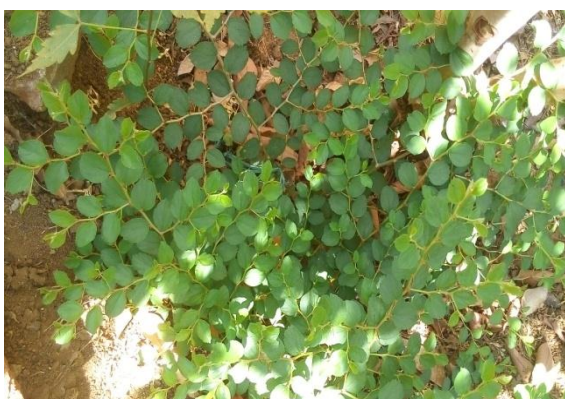
56. *Strychnos nux-vomica*



57. *Triumfetta rhomboidea*



58. *Wrightia tinctoria*



59. *Zizyphus jujuba*



60. *Saccharum officinale*

Fig. 2: Ethnobotany of Kalrayan hills, Tamil Nadu.

Table 1: Ethnomedicinal plants used by indigenous people of Kalrayan hills, Villupuram district, Tamilnadu.

Sl. No	Vernacular Name	Binomial Name	Family	Plant Part used	Phytochemicals	Uses
1.	Nayurvui	<i>Achyranthus aspera</i>	Amaranthaceae	Seed, leaf, root	Achyranthine, betaine	The leaf juice is used for stomach ache, piles, boils and skin eruptions. A decoction of powdered leaf with honey or sugar is used for diarrhea and dysentery.
2.	Tutthi	<i>Abutilon indicum</i>	Malvaceae	Seed, leaf, bark	Mucilage, tannins, flavonoids, beta-sitosterol	It is used in treating gout, Tuberculosis, ulcers, bleeding disorders and against worms. Roots are used for fever, chest infection and urethritis
3.	Sirru – Pulay, Kapurimadhuri	<i>Aerva lanata</i>	Amaranthaceae	Leaf, flower, root	alkaloids, flavonoids, tannins	Demulcent, Diuretic, Memory enhancer, Anti-diarrheal, digestive
4.	Kadhalai, Sisal	<i>Agave sisalana</i>	Liliaceae	Leaf, root	Alkaloids, tannins, cardiac glycosides, coumarins, phlobatannins	Blood pressure, antiseptic, stimulates the intestinal and uterine musculature, pulmonary tuberculosis, diseased liver and jaundice laxative. Sisal fibre is made from the leaves of the plant
5.	Azhinjil	<i>Alangium salivifolium</i>	Alangiaceae	Root, bark	Alangicine A and B, sterols	Rabies, snake bite, diarrhea, abdominal pain, ascites, skin diseases and leprosy, laxative, constipation. Flatulence, heals wounds
6.	Katralai	<i>Aloe barbadensis</i>	Liliaceae	fleshy stem	Anthraquinone glycosides-barbaloin, aloin, isobarbaloin and aloe emodin	Sting wounds, burns, insects, bites, rashes, sores, herpes, athlete's foot, vaginal infection, allergic reaction, dry skin Psoriasis, warts, wrinkles from aging eczema
7.	vembu	<i>Azadirachta indica</i>	Meliaceae	Leaf, fruits, seed bark, flower, root	Alkaloids-nimbin, nimbidin	Anthelmintic, relieve nervous head ache, hysteria, rheumatism.
8.	Moongil	<i>Bambusa vulgaris</i>	Poaceae	Leaf, root, seed	Acetylcholine, flavonoids-vitexin, orientin	Aphrodisiac, tonic, astringent, stimulant, antispasmodic
9.	Purple Butterfly tree (Eng) Kaniar Kofa, Khairual (Hindi)	<i>Bauhinia purpurea</i>	Caesalpiaceae	Leaves, flower, root, bark, stem	Alkaloid, steroid, glycoside, saponins, flavonoids	Flatulence, Diarrhea ulcers, laxative, Rheumatic pain, swelling, Dropsy. Asthma, cold, Anti-cancer, Diarrhea, Dysentery and Piles, relief from heavy menstrual flow, animal bites, Antidote.

10.	Ballon vine, Blister creeper, Heart seeds (Eng)	<i>Cardiospermum halicacabum</i>	Sapindaceae	Roots, leaves and seeds	Apigenin, luteolin, and apigenin-7-O- glucoside	Rheumatism, nerves disease, piles and chronic bronchitis earache, lumbago, abortion.
11.	Crame berry (Eng) Karonda (Denvanagai)	<i>Carissa carandas</i>	Apocynaceae	Fruit, leaves roof	lupeol, $\beta$ -sitosterol, 16 $\beta$ - hydroxybetulinic acid, $\alpha$ -myrin, $\beta$ - sitosterol glycoside	Anemia, antiscorbutic, urine related problems.
12.	Rose periwinkle	<i>Catharanthus roseus</i>	Apocynaceae	Whole plant	actineo plastidemic, Vinblastin, Vincristine, Vindesine, Vindeline Tabersonine	Treatments of cancer tonic, appetizer.
13.	Wild sage (Eng) Unnichedi (Tma) Caturang (Hindi)	<i>Lantana camara</i>	Verbenaceae	leaves and young shoots	bicyclogermacrene, $\beta$ -caryophyllene, germacrene D and valecene (12.0%)	Antirheumatic, antimalarial, Ulcers, swelling, viscera, hepatic necrosis, cholestasis, weakness stomachic, stimulant sedative, vermifuge, nervine, depurative, diaphoretic, carminative antiseptic, antipyretic, alexiteric etc.
14.	Wolly-top / Feather - top (Aus) Feather finger grass (USA)	<i>Chloris virgata</i>	Poaceae	Whole Plants	Saponins, triterpenoids, glycosides	antimicrobials
15.	Pirandai (Tam)	<i>Cissus quadrangularis</i>	Vitaceae	Stem, root	Amyrin, quercetin, Kaempferol, $\beta$ - sitosterol	Diuretic, purify blood, fractures
16.	Oduvan (Tam) Karra	<i>Cleistanthus collinus</i>	Phyllanthaceae	Leaves, fruit seed, bark	Tannins, glycosides, alkaloids, terpenes	Toxic shrub, it used for deliberate self - harm in rural south India.
17.	Vaminta (Telug) Tilavan - Marthi Shona cabbage	<i>Cleome gynandra</i>	Capparidaceae	Whole plant	Phenolics, flavonoids, proanthocyanidins	Sinus infection, Insect bites, wound, mild fever
18.	Nariyal Thannai (Tam)	<i>Cocos nucifera</i>	Palmaceae	Flower, root, fruits	phenols, tannins, leucoanthocyanidin s, flavonoids, triterpenes, steroids, and alkaloids	Useful in thirst, fever urinary disorders. Uterine disease.
19.	Coco - grass purple nut sedge red out sedge	<i>Cyperus rotundus</i>	Cyperaceae	Root, rhizome	flavonoids, coumarins and tannins	Useful in fever, diarrhea, dysentery, dyspepsia, vomiting, cholera, Intestinal disorders.
20.	Snake Sula	<i>Delonix elata</i>	Caesalpinaceae	Leaves, bark	caffeic acid and apigenin	Rheumatism, flatulence anti-periodic
21.	Fox glove	<i>Digitalis purpurea</i>	Scrophulariaceae	Leaves	Digoxin, volatile oil	Cardio vascular system, cardiac oedema with diuresis, heart failure
22.	Viralli (Tam) hopbush	<i>Dodonaea viscosa</i>	Sapindaceae	Leaves, flower pods	Clerodane diterpenoids, phenolics	Alleviate symptoms, cough and sore throat.

23.	Karisalanganni	<i>Eclipta prostrata</i>	Compositae	Foot, leaves	wedelolactone, eclalbasaponin I, luteolin and luteolin-7-O-glucoside	Hepatic and Spleen pains, Various chronic skin disease, urinary troubles
24	Double row love-grass	<i>Eragrostis bifaria</i>	Poaceae	Whole plant	Flavonoids, glycosides	Fever, dysentery
25.	Indian Acalypha (Eng), Kuppaimeni (Tam)	<i>Acalypha indica</i>	Euphorbiaceae	Flower, leaf, root, stalk	Flavonoids, acallyphamide	Diuretic, emmenagogue Vomiting, locative and anthelmintic
26.	Tanner's Cassia (Eng) Tarvar (Hindi) Aavaram (Tam)	<i>Cassia auriculata</i>	Caesalpiaceae	Bark, leaves, flower, fruit root	Alkaloids, flavonoids, saponins	Tanning skins, astringent and tonic, refrigerant, stomach ache, conjunctivitis. Urinary discharges hypoglycemic activity.
27.	Bermuda grass	<i>Cynodon dactylon</i>	Poaceae	Root, Stalk, rhizome	flavonoids, alkaloids, glycosides, terpenoids, triterpenoids, steroids, saponins, tannins, resins	Body heat, quench abnormal thirst, free for urine, good tonic for convalescent period and aphrodisiac. Vomiting
28.	Vishnugrandi (Tam)	<i>Evolvulus alsinoides</i>	Convolvulaceae	Whole Plant	phenols, tannins, saponins, pseudo tannins, flavonoids, saponins, glycosides, steroids, glycosides, terpenoids	Tuberculosis, fever dysentery, swelling.
29.	Senganthal, Kalapai kilangu	<i>Gloriosa suerba</i>	Liliaceae	Seed and roots	alkaloid, flavonoids, glycosides, phenols, saponins, steroids, tannin and terpenoids	Ulcer, infertility snake repellent, laxative, alexiteric, leprosy piles.
30.	Tavidu, kalunnu	<i>Grewia hirsuta</i>	Malvaceae	Fruits, roots, seeds	phenolics, carbohydrates, alkaloids, flavonoids and tannins	Bleeding disorder dysuria, anti-aging aphrodisiac
31.	Nannari (Tam)	<i>Hemidesmus indicus</i>	Asclepiadaceae	Root and Latex	Alkaloids, Amino acid, Flavonoids Saponins and Tannins	Skin disease, fever nutritional disorders cough and diarrhea.
32.	Gopuran fruits	<i>Indoneesiella echioides</i>	Acanthaceae	Flowers, Fruit	alkaloids, terpenes, triterpenoids saponins, saponins, phenolic compound, steroids	Night blindness, leucorrhoea, ulcer.
33.	Chentam	<i>Launaea sarmentosa</i>	Asteraceae	Entire Plant	Tannin, alkaloids, flavonoids, saponins, phenols, coumarins, quinones and	Soporific, tonic, diuretic and aperient.

					phytosterols	
34.	Henna Plant (Eng) Mehendi (Hindi) Maruthani (Tam)	<i>Lawsonia inermis</i>	Lythraceae	Leaves, flower seed, roof	cardioglycosides, terpenoids, tannins, phenolic compounds, proteins and quinones	Astringent, increase bile sedative, deodorant skin disease, antibacterial anti- fungal dye for hair.
35.	Thumbai (Tam)	<i>Leucas aspera</i>	Lamiaceae	Leaves Flower	triterpenoids, oleanolic acid, ursolic acid and beta-sitosterol, nicotine, sterols, glucoside, diterpenes, phenolic compounds	Psoriasis, Painful swelling cough, cold
36.	Thumbai	<i>Leucas zeylanica</i>	Lamiaceae	Flower, Root	Polyphenols, flavonoids, quercetin	Stimulant, Cough, Cold, abdominal Pain anorexia, jaundice.
37.	Pirnakku keerai (Tam)	<i>Melochia corchorifolia</i>	Sterculiaceae	Leaves	flavonoids and tannins	Increase the urine, loosens and feces.
38.	Thottasinungi	<i>Mimosa pudica</i>	Mimosoideae	Leaf, Roof	terpenoids, flavonoids, glycosides, alkaloids, quinines, phenols, tannins, saponins and coumarins	Urinary complaints, fistulose sores, piles scorpion - sting.
39.	Kattu Murungai, (Tam) Horse raddish (Eng)	<i>Moringa concanesis</i>	Moringaceae	Entire Plant	Alkaloids, flavonoids, steroids	Rheumatism, carminative stimulant, relieve pain of gout.
40.	Parpataka Porpadagam (Tam)	<i>Mollugo cerviana</i>	Aizoaceae	Entire Plant	alkaloids, flavonoid s, saponins, triterpenoids, tannins, glycosides and phenolics	Fever, high pitta, gastritis, diarrhea.
41.	Kurry leaf (Eng) suleet Nim	<i>Murraya koenigii</i>	Rutaceae	Bark, Leaves Root	Flavonoids, alkaloids, sterols	Useful in vomiting, dysentery, fever.
42.	Karun (Tam) Tulsi, holy basil (Eng)	<i>Ocimum tenuiflorum</i>	Lamiaceae	Leaves, roof stem	alkaloids and tannins, Cardiac glycosides, saponins and flavonoids and terpenoids	Malaria cough cold hepatic, disinfection, alleviate nausea, vomiting, diarrhea, flatulence.
43.	Rice, Paddy (Eng) Nel - (Tam)	<i>Oryza sativa</i>	Poaceae	Rice grain	$\gamma$ -oryzanol and several tocochromanols, tocotrienols and tocopherols	Internal inflammation soothing, sedative, great energetic.
44.	Chiththamutti (Tam) Bala (San) Chittamutti (Telu)	<i>Pavonia zeylanica</i>	Malvaceae	Whole Plant	Flavonoids, alkaloids, phenols	Emollient

45.	Mango (Eng) Mang or Manga (Tam)	<i>Mangifera indica</i>	Anacardiaceae	Leaves, flower fruits, seed, bark	Lignin, alkaloids	Constipation, bleeding dysentery, asthma, diarrhea, bleeding piles.
46.	Nellikai (Tam) Toppi, Indian goose berry	<i>Phyllanthus emblica</i>	Euphorbiaceae	Leaves, flower, fruits	quercetin, phyllaemblic compounds, gallic acid, tannins, flavonoids, pectin and vitamin C	Carminative, diuretic, aphrodisiac, laxative, astringent, refrigerant, anemia, jaundice, dyspepsia, hemorrhage disorders, diabetes, asthma, bronchitis, useful as mouth wash.
47.	Keelanelli	<i>Phyllanthus niruri</i>	Euphorbiaceae	Entire Plant	Alkaloids, tannins, coumarins, polyphenols	Diabetes, sores external use, fever, remedy for jaundice.
48.	Sarpagandha	<i>Rauvolfia serpentina</i>	Apocyanaceae	Root and leaves	Alkaloids, phenols, tannins	Worm and hypertension mental disorders removal of opacity.
49.	Marul	<i>Sansevieria roxburghiana</i>	Liliaceae	Rhizome, stem	Saponins, flavonoid s, phenols, alkaloid, anthocyanin and cyanin, glycosides	Cough, clear their throats, viscid phlegm.
50.	Sugarcane, Karumbu	<i>Saccharum officinale</i>	Poaceae	Stem, leaf	fatty acid, alcohol, phytosterols, higher terpenoids, flavonoids, -O- and -C-glycosides, and phenolic acids	anti-inflammatory, analgesic, anti- hyperglycemic, diuretic, and hepatoprotective
51.	Sandanam	<i>Santalum album</i>	santalaceae	Extract of wood, oil of wood	$\alpha$ - and $\beta$ -santalols, essential oil	Disinfectant, fever, cooling effect, flow of urine, skin disease, relieving scabies, cosmetic formulation.
52.	Manathakkali (Tam)	<i>Solanum nigrum</i>	Solanaceae	Leaf, Fruit	Alkaloids, tannins	Fever, Allay Pain Ointment, skin disease, ulcer.
53.	Thoodhuvalai (Tam)	<i>Solanum trilobatum</i>	solanaceae	Leaves, Root	Alkaloids, Flavonoids, Saponins, Tannins, Cardiac glycoside, Terpenoids	Asthma and Difficult Parturition, tuberculosis.
54.	Etti	<i>Strychnos nux- vomica</i>	Loganiaceae	Fruit, leaves seeds	protostrychnine, vomisine, <i>n</i> - oxystrychnine, pseudostrychnine, isostrychnine, chlorogenic acid and glycoside	Pain, Oedema, arthritis, Oozing ulcers, central nervous system stimulant.
55.	Ottarai	<i>Triumfetta rhomboidea</i>	Malvaceave	Flower, fruits, leaves,	glycosides, phytosterol, steroids, flavonoids, tannin and phenolic compounds	Dysentery, diarrhea, diuretic.
56.	veppalai	<i>Wrightia tinctoria</i>	Apocynaceae	Seeds, leaves, Bark	alkaloids, flavonoids, phenols, saponins, steroids and tannins	Stomachic, tonic, febrifuge leaves chewed to relieve toothache, seminal weakness.



57.	Ilandai	<i>Zizyphus jujuba</i>	Rhamnaceae	Leaf, bark, root, fruit	ziziphussaponin I, ziziphussaponin II, ziziphussaponin III (ziziphussaponin I, II, III), jujuboside	Blood purifier, delirium rheumatism.
58.	Passion fruit	<i>Passiflora edulis</i>	Passifloraceae	Fruit, leaves	glycosides, flavonoids, alkaloids and phenolic compounds	Lowers BP, sedative, antispasmodic, insomnia, gastrointestinal disorders, menopausal symptoms, kills cancer cells <i>in vitro</i>
59.	Avarai	<i>Dolichos lablab</i>	Fabaceae	Entire Plant	Phenols, steroids, essential oils, alkaloids, tannins, flavonoids, saponins, coumarins, and anthranoids	Phlegmatic disorder aphrodisiac, nose bleeding tumors, adenitis, sores burns, measles, smallpox, dysuria.
60.	Aavi	<i>Anogeissus latifolia</i>	Combretaceae	Flower fruits	alkaloids, glycosides, flavonoids, flavanols, phenols, saponins and terpenoids	Diarrhea, dysuria, cold cough, cholera piles, snake bite.

human ailments. The ethno floristic composition of the study area was dominated by angiosperms. Among the 36 families and 60 plant species, 34 families belonged to dicotyledons having 54 plant species, 2 families of monocotyledons with 6 plant species. The family wise analysis of the ethnic species revealed that 60 species belonging to 36 families with ethnobotanical importance were furnished (Fig. 3). The family Poaceae was represented by five species, Euphorbiaceae, Apocynaceae, Malvaceae and Liliaceae were represented by four species each, Lamiaceae was represented by

three species, Amaranthaceae, Asteraceae, Fabaceae, Solanaceae and Sapindaceae were represented by two species and Alangiaceae, Aizoaceae, Asclepiadaceae, Anacardiaceae, Acanthaceae, Arecaceae, Colchicaceae, Combretaceae, Convolvulaceae, Cyperaceae, Capparidaceae, Loganiaceae, Lythraceae, Mimosoideae, Meliaceae, Moringaceae, Palmaceae, Passifloraceae, Phyllanthaceae, Rhamnaceae, Rutaceae, Santalaceae, Schrophulariaceae, sterculiaceae, Verbenaceae, Vitaceae were represented by one species each (Fig. 3).

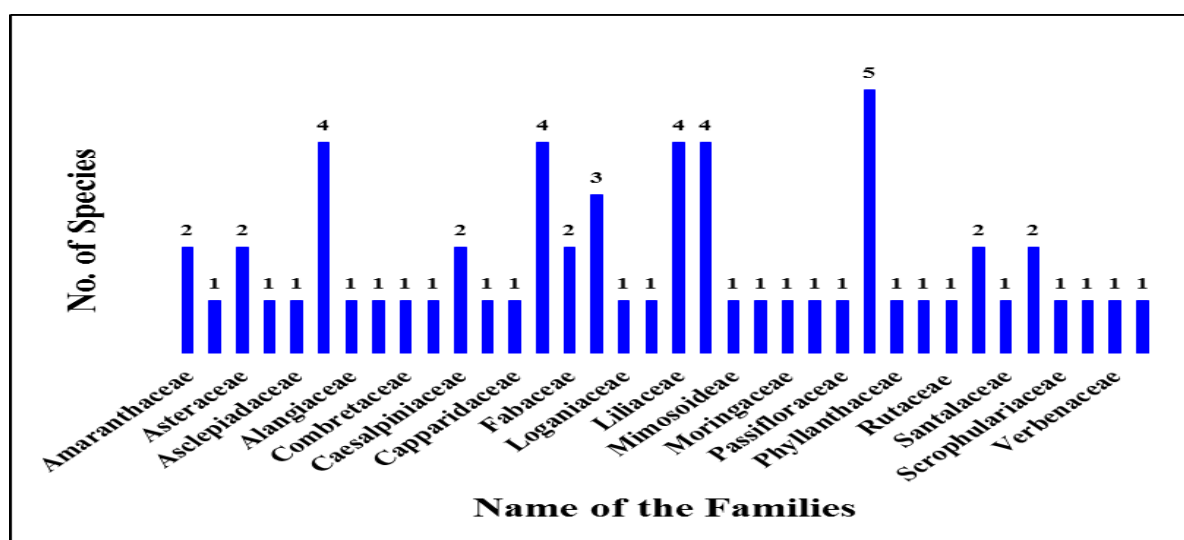
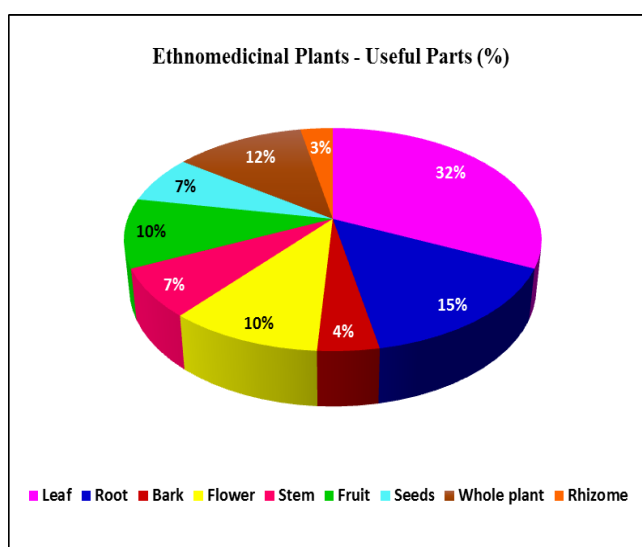


Fig. 3: shows the number of Plants belonging to individual families.

The villagers used various medicinal plants to remediate variety of diseases and ailments like diarrhea, diabetes, asthma, fever, jaundice, rheumatism, wounds, cuts, stomach pain, cough, cold, poisonous bites, body heat,

body pain, bowel complaint, bronchitis, dysentery, earache, eczema, eye troubles, hair growth, intestinal worms, jaundice, leprosy, menstrual trouble, piles, pimples, ulcer, tooth-ache, urinary troubles, vomiting,

gonorrhoea, TB, ulcers, inflammation etc. The villagers used diverse parts of the medicinal plants based on their ability to cure disease. Various parts of the plant includes leaf, roots, bark, seed, fruit, flower, stem, etc. possessed medicinal activities (Fig. 4). Among the various plant parts, leaves (32%) were found to be highly used followed by root (15%), whole plant (12%), flower and fruit (10%), stem (7%), bark (4%) and rhizome (3%). These medicinal plants are used in the form of juice, paste, powder, extract and decoction, cooked or raw forms. In majority of cases, fresh preparations are administered to avoid other complications of the drug caused due to storage. The age of the plant and part to be used is also a valuable factor while selecting them as drugs. In some cases, young parts or buds are found to be useful.



**Fig. 4:** shows the percentage of plant parts with therapeutic activity.

From earliest times people have made use of plants for their basic needs, sustenance, medicare and livelihood. Some plants used by tribal people are cultivated, while others grow in wild conditions. The tribals depend predominantly on plants for food, clothing, housing, medicine, oil, agricultural implements, arts and crafts and a host of other requirements. They also have some superstitious beliefs on some plants which were found to be tied/ worn on the body parts to cure various ailments. It is well known that during the process of evolution plants have synthesized compounds whose structured diversity is often beyond the dreams of even the most imaginative organic chemists. Plants are still the main source of medicines to majority of people. Reliance on traditional medicine is not only associated with the traditional belief of its effectiveness but also on harmonious existence of spirit and matter. The efficacy of herbal medicines is believed to be enhanced when they are prepared and administered by enhancing mantras and incantations.

The major resource of medicines arising from plants and their phytochemical constituents and medicinal

properties of most of the medicinal plants were recorded in the last few decades by a number of workers (Ayyanar and Ignacimuthu, 2011). These medicinal plants are subjected to various processes and are then administered to the patients. The present study provides information about some therapeutic compounds (phytochemical) of the above said plants (Table 1). Most of the plants encountered in this survey have also been worked out by different scientists and reported the presence of alkaloids, terpenoids, tannins, phenols, and glycosides, further detailed (Salai Senthil *et al.*, 2015; Kumaran *et al.*, 2016). The survey and documentation of medicinal and aromatic plants in each and every place is mandatory for easy identification of local traditional healers, conservation and sustainable utilization. The most important utilization of these plants is through medicines. However, plants and their parts and the pattern of administration vary from person to person. Thus, there is enormous scope for tribal medicines based on plant products which are yet to be studied, analyzed and documented (Sujatha and Mariyaselvam, 2015).

The present study of ethnomedicinal-botany of Kalrayan hills, Eastern Ghats was undertaken to identify the ethnomedicinal plants with wider uses and carryout detailed studies to validate the curative properties. Kalrayan hills of Eastern Ghats is serving as a cradle for a rich diversity of medicinal plants for a long time. The issues of medicinal plant conservation have been the focus of many formal and informal discussions at national and international forums, seminars, workshops, conferences and congresses in the last 10 years. Various conservation methods were mentioned in the past by many authors are being repeated at present. These methods include protection of wild species *in-situ*, cultivation in botanical gardens and collection of Germplasm for establishment of Germplasm banks, public information campaigns and others.

There are plenty of possible applications of this work for use in the treatment of various diseases among the rural people. The indigenous people are using these plants from several thousands of years till today to treat many infectious and non-infectious diseases. Besides this another important application of this study is to create awareness among the rural people on traditional medicinal plants. The present investigation is very important because the herbal drugs are free from toxicity and side effects. The herbal drugs are also used as house hold remedy for common diseases since time immemorial. The present study mainly focuses the importance, uses and conservation of the medicinal plants used by the people at Kalrayan hills. The unprecedented interest and demand for plants with medicinal properties and potency for treatment of various ailments is causing over exploitation of such plant genetic resources. According to Igoli *et al.* (2005), the depletion rate of plant resources generally is high, yet little is known about most of the world's plant species especially tropical floras (Yachi and Loreau, 1999).

When viewed against the current rate of extinction and decimation of the forests in this area, there is the need to conserve what is left as forests for posterity sake.

## CONCLUSION

The efforts of biodiversity on ecosystem process have received much attention because of the growing concern that loss of biodiversity may impair ecosystem functioning. Specific action programs need to be implemented for sustainable use of these resources together with ethno-medico-biological knowledge base. In view of various resources use, habitat uniqueness and human pressure on the forest resources, the need for conservation of the Kalrayan hill sites is stressed.

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