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A Glimpse into the Indian Traditional Medicine with Special Reference to Use of *Hemidesmus indicus* in Southern India: A Review

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ABSTRACT: The medicinal and pharmacological aspects of plants are one such asset to the human race right through the evolution. The plants which are nutritionally rich and also loaded with some additional values like antioxidants, vitamins, proteins or some specific secondary metabolites are categorized as nutraceuticals plants. Ethanomedicinal usage of plants is not only limited to the knowledge of medicinal and aromatic plants but has been stretched to the exploration in the fungal world especially the lichens. India being a mega biodiversity country has enormous potential in this field of traditional medicines. Primitive societies were dependent on herbal remedies for the treatment and disorders since time immemorial. Either it may the use of herbal *kadha* (tea/ decoction/extract) or may be use of spices oils in the steam inhalation during the ongoing Corona pandemic, world has perceived the potential of Indian Ayurvedic system in the safe treatment of tough body illness through minimal usage of chemical drugs. Novel approaches like phytochemical estimation and green synthesis of nanoparticles through reducing chemistry has opened a new channel for herbal drug analysis. *Hemidesmus indicus* in Southern Indian medicinal flora with all forms of medicinal plants having variety of biological activities has been amongst the most used herb in form nutraceuticals.

Keywords: pharmacological, antioxidants, Ethanomedicinal, *kadha*, *Hemidesmus*, etc.

INTRODUCTION

The plant world is full of amazing herbs and trees which serve to mankind in various ways. From feeding to nurturing, plants provide us with a lot of beneficial aspects. The medicinal and pharmacological aspects of plants are one such asset to the human race right through the evolution. The humans from the very beginning have their feeding habits in such a way that it not only gives nourishment, instead also fulfills the demands of the body to carry out its vital functions smoothly. The plants which are nutritionally rich and also loaded with some additional values like antioxidants, vitamins, proteins or some specific secondary metabolites are categorized as nutraceuticals plants.

Nowadays, array of studies are focusing on the plants, which have been traditionally used in Ayurvedic medicines as a source of nutraceuticals and treatment of body ailments. According to a World Health Organization (WHO) estimates, 80% of developing countries population have a keen interest in traditional medicines for curing their day to day health issues. India being a mega biodiversity country has enormous potential in this field of traditional medicines. Ayurveda has its root in the Indian soil and it had developed its Indian *Materia medica*, which is serving the people throughout the ages and has been an excellent way of keeping diseases and ailments at a bay by following simple rules of healthy lifestyle. Traditional medicines, indigenous and folklore knowledge is the result of studies of plants by our fore fathers through ages. The usage of traditional and folklore medicines is related to the people's perspective of living and their feeding habits [1].

A. Medicinal plants: Store house of natural medicinal compounds

Medicinal plants have been key agents for therapeutic agent for humans and still follow a leading in disease cure. The Indian medicinal practice dates back to more than 5000 years back, in the ages of noted ancient literatures like 'Rig- Veda' and 'Atharva-Veda'; following literatures like 'Charak Samhita' and 'Sushruta Samhita' in the 10th century BC, which highlights the application of plants for the wellness of health [2,3,4]. Ethanomedicinal usage of plants is not only limited to the knowledge of medicinal and aromatic plants but has been stretched to the exploration in the fungal world especially the lichens [5]. Lichens have been of great use in pharmacological and nutrition deriving substances. The special

antimicrobial secondary metabolites have found a lot of application in the medical world especially as a potent antimicrobial agent, as an anti-inflammatory compound, anti-diabetic, etc. [6, 7, 8, 9, 10].

Traditional medicines knowledge is widely based on the usage of the various plant parts *viz*., roots, rhizome, whole stem, part of stem, flower, fruit, latex, gum, resin, exudates, leaves and their secretion and the tree bark, or the whole herbaceous plant. These plant parts have peculiar identification marks which are used for their identification as a potential herb for curing the disease like, cold, fever, cough, headache, diarrhoea, skin rashes, eczema, fertility problems, toothache, stomach ache, wound infections, diabetes, rheumatism, asthma, dysentery, small pox, bone fractures, earache and hair loss and even more. Primitive societies were dependent on herbal remedies for the treatment and disorders since time immemorial. Indian traditional medicine has found its place well established because of its link originated in the culture.

In the current scenario, where modern medicine system has evolved a lot in the past some decades, the relevance of Indian traditional medicine is still presenting tough fight with their modern medical world rivals. Either it may the use of herbal *kadha* (tea/ decoction/extract) or may be use of spices oils in the steam inhalation during the ongoing Corona pandemic, world has perceived the potential of Indian Ayurvedic system in the safe treatment of tough body illness through minimal usage of chemical drugs.

B. Traditional knowledge of rich medicinal plant flora of Southern India

India is rich in its own flora that is, endemic plant species (5,725 angiosperms, 10 gymnosperms, 193 pteridophytes, 678 bryophytes, 260 liverworts, 466 lichens, 3,500 fungi and 1,924 algae) (Sanjappa, 2005). In India, the main traditional systems of medicine include Ayurveda, Unani and Siddha use over 7,500 plant species have been reported. Traditional healers provide considerable information about the use of many plants or plant parts as medicine. The World Health Organization (2003) has estimated that 80% population of the developing countries is unable to afford pharmaceutical drugs and rely on traditional herbal medicines, to sustain their primary health care needs. India is one of diverse countries in the world, rich in medicinal herbs and plants. In Indian traditional system of medicine, herbal medicines have been used primordially.

The southern India is mostly considered rich in terms of floral vegetation because of the Western Ghats which encompasses major areas of states of Karnataka, Tamil Nadu and Kerala. The distribution of forest and preservation practices has made the researchers to explore and document the traditional knowledge of medicinal plants in a well systematic manner. Ethnobotanical survey of plant in one research study area of TN shows plants with all sorts of bioprospective values. Major plant species which were collected for the study belongs to Fabaceae, Asterceae, Euphorbiaceae, Moraceae, Lamiaceae, Apocynaceae, etc. [1].

Ethnic tribes and rural people have been versed with the use of medicinal herbs and plant parts and have been well known from diverse cultural backgrounds. System of traditional and folklore medicine had seen breakthrough developments in the past. Evidences clearly state that, system of medicine like Ayurveda, Siddha, Unani and Homeopathy have found their place in the lives of people for their healthcare and wellness [11]. Ayurveda and Siddha system have roots in Indian soil and had been in use from centuries in South India. In fact, Siddha system originated in South India. Currently, it has been recognized as an alternative system of medicine. Siddha system practices plant based (moola vargam), mineral based (thaathu vargam) and animal product based (jeeva vargam) medicinal applications for health wellness and cure [12].

Silambarasan, *et al*., 2017 [13] reported in their survey based statistical study on traditionally used plants by *Malayali* and *Narikuravar* ethnic communities revealed exciting results. The result showed a total of 69 medicinal plant species, which belong to 33 families. For the reported MPs, herbs dominated with a total 29 species accounting for 42%, which was followed by tree species (27%), while climbers and shrubs were 22% and shrubs 9%, respectively. The dominant family was Fabaceae (8 sps.) followed by Amaranthaceae (5 sps.). The most prominent method of application of herbal preparation was in form of paste (28%), followed by preparation in form of juice or decoction from crude herbs powder. Some other methods included soup, crushing and oil preparation. Jaggery or honey was used as additive from some bitter tasting herbs. These herbal drugs are generally administered orally, topically or by simple chewing.

A few Indian medicinal plants have also been examined for antiviral activities [14], but little work has been reported on the plants of Tamil Nadu, in spite of their common uses by many tribal groups throughout the region for the treatment of various diseases, including possible virus infections [15,16,17]. Vimalanathan, *et al*., 2009 [18]; have reported in their studies about the antiviral activity against non-membrane virus FCV (Feline Calicivirus) by *P. daemia,* and *Caesalpinia bonduc* (L.) Roxb. (Caesalpiniaceae) prominently. Notable antiviral activity against rhinovirus was also observed in the plants of *G. sylvestre, S. indicus, and V. trifolia* but relatively moderate. Further, in his studies, on antiviral potential of plants collected from Tamil Nadu region showed some promising results, where moderately active with MIC ranging from 7.8 to 62 µg/mL from extracts of plants *Gymnema sylvestre* R. Br. (Asclepiadaceae), *Pergularia daemia* (Forsskal)

Chiov. (Asclepiadaceae), *Sphaeranthus indicus* L. (Asteraceae), *Evolvulus alsinoides* L. (Convolvulaceae), *Leucas aspera* Spr. (Lamiaceae), *Vitex trifolia* L. (Verbenaceae), and *Clerodendrum inerme* (L.) Gaertn (Verbenaceae) were also the most active against Mouse Coronavirus (MCV) and Herpes Simplex Virus (HSV) was observed while *Cassia alata* L. (Caesalpiniaceae) was active against MCV, but not HSV.

Table 1: Medicinal plants reported from study in South India having relevant pharmacological application [18, 19].

Sr. No.	Family/species	Plant part	Traditional use
1.	Acanthaceae/ *Rungia repens* Nees.	Aerial parts	Juice applied on the skin to treat skin diseases including itching of the skin
	Rhinacanthus communis Nees.	Aerial parts	Paste of the leaves is applied externally to treat eczema and herpes
2.	Apocyanaceae/ *Wrightia tinctoria* R. Br.	Aerial parts	Leaves are used to treat various skin disorders including herpes, psoriasis and nonspecific dermatitis
3.	Aristolochiaceae/ *Aristolochia indica* L.	Aerial parts	Paste of the aerial part is mixed with neem leaf and burned, the fumes are inhaled to treat migraine
4.	Asclepiadaceae/ *Pergularia daemia* (Forsskal) Chiov.	Aerial parts	Decoction from the aerial part is taken internally to get relief from fever
	Gymnema sylvestre R. Br.	Aerial parts	Powder made from the aerial parts of *Gymnema* to treat a variety of other disorders is taken internally to treat diabetes, digestion problems, cough, constipation, and malaria
5.	Asteraceae/ *Wedelia chinensis* (Osbeck) Merr.	Aerial parts	Widely used in India to treat jaundice and other liver and gall bladder ailments
6.	Bombacaceae/ *Durio zibethinus* L.	Leaf juice	Applied on the head of a patient with fever. The leaves are employed in medicinal baths to treat jaundice
7.	Boraginaceae/ *Trichodesma indicum* R.Br.	Aerial parts	In treatment of diseases related to urinary system and also to treat patients having the problem of piles specially the bleeding piles
8.	Cleomaceae/ *Cleome pentaphylla* L.	Aerial parts	The juice of the leaves has been used to relieve earache and itching
9.	Caesalpiniaceae/ *Caesalpinia bonduc* (L.)Roxb.	Aerial parts	The seeds are bitter and they are useful in treating inflammation, cough, asthma, leprosy, skin diseases, dysentery, colic and intestinal worms
	Cassia alata L.	Leaves	Crushed leaves are rubbed on ringworm-affected skin, for immediate relief
10.	Convolvulaceae/ *Evolvulus alsinoides* L.	Aerial parts	Decoction made from the aerial part is taken internally to treat dysentery, falling and graying of hair and to treat fever
11.	Cucurbitaceae/ *Mukia maderaspatana* (L.) M. Roemer	Aerial parts	The leaves are used as a poultice in treating skin eruptions. It is used internally in the treatment of gonorrhea
12.	Euphorbiaceae/ *Ricinus communis* L.	Aerial parts	The decoction of the leaf is used as hair tonic/alopecia
	Jatropha curcas L.	Aerial parts	Paste of young leaf is applied to treat cuts and wounds
	Indigofera tinctoria L.	Aerial parts	*Indigofera tinctoria* is heated with *Cansjera rheedi* Gmel. (Opiliaceae), gingili, castor and coconut oil and taken internally for 40 days to treat poisonous bites.
13.	Fabaceae/ *Clitoria ternatea* L.	Aerial parts	Paste made from the aerial part is taken internally to treat pulmonary tuberculosis
14.	Clusiaceae/ *Garcinia mangostana* L.	Rind	A portion of the rind is steeped in water overnight and the infusion is given as a remedy for chronic diarrhea in adults and children.

15.	Lamiaceae/ *Leucas aspera* Spr.	Aerial parts	Leaves and flowers are used for inhalation through nose to cure migraine. In addition, two drops of the juice of the flowers is useful as a nasal drop. Juice of the leaves is used as local application to treat psoriasis, chronic skin eruptions and chronic rheumatism
16.	Lythraceae/ *Woodfordia fructicosa* Kurz.	Aerial parts	The leaves are used in bowel complaints and hemorrhages
17.	Malvaceae/ *Abutilon indicum* G. Don.	Aerial parts	Leaves of *Abutilon indicum* were traditionally used to treat bronchitis, gonorrhea, and as mouthwash in toothache
18.	Papaveraceae/ *Argemone mexicana* L.	Aerial parts	The fresh yellow, milky, acrid sap contains protein-dissolving substances and has been used in the treatment of warts, cold sores, cutaneous affections, skin diseases and itches
19.	Pedadiaceae/ *Pedalium murex* L.	Aerial parts	Soaked and stirred in milk for few minutes until the milk becomes thick and is taken internally to treat diabetes, urinary irritations, uterine and puerperal diseases and local ulcers
20.	Rubiaceae/ *Morinda pubescens* J. E. Sm.	Aerial parts	Decoction of this plant is taken internally to treat diarrhea and dysentery
	Oldenlandia corymbosa L.	Aerial parts	Decoction made from the whole plant with *Evolvulus alsinoides*, *Coscinium fenestratum* (Gaertn.) Colebr. (Menispermaceae) is used to treat cough, insomnia
	Spermococe hispida L.	Aerial parts	Decoction of the aerial part is taken to get relief from colic, flatulence and general debility.
21.	Sapindaceae/ *Cardiospermum halicacabum* L.	Aerial parts	Paste made from leaves is taken internally to treat chronic rheumatism and arthritis.
22.	Solanaceae/ *Datura metel* L.	Aerial parts	The decoction of leaf is used to counter ringworm, tooth ache, rheumatism, constipation and asthma.
23.	Verbenaceae/ *Clerodendrum inerme* (L.) Gaertn	Aerial parts	Leaf juice is used to get relief from fever; flower juice is used to treat eye infection. Leaves are pounded with coconut oil, and applied on the affected area to treat skin rashes
24.	*Vitex trifolia* L.	Aerial parts	Leaf, fruit and root are used to cure rheumatism, contusion and fever, dermatitis and eczema.
25.	Annonaceae/ *Annona squamosa* L.	Ethanolic leaf extract	Antihyperglycemic effect
26.	Asteraceae/ *Artemesia pallens* Wall ex. DC.	Essential oil from aerial plant part	Reabsorption of glucose is inhibited
27.	Arecaceae/ *Areca catechu* L.	Nuts and aerial plant part	Utilization of peripheral glucose increases
28.	Amaranthaceae/ *Beta vulgaris* L.	Rhizome/ Root	Enhances glucose tolerance
29.	Nyctaginaceae/ *Boerhavia diffusa* L.	Rhizome/ Root	Antioxidant, plasma insulin level increases, activity of hexokinase increases
30.	Malvaceae/ *Bombax ceiba* L.	Aerial plant part	Hypoglycemic
	Hibiscus rosa-sinesis L.	Flowers/ leaf	Triggers insulin release from pancreatic beta cells
31.	Theaceae/ *Camellia sinensis* (L.) Kuntze	Leaf	Antioxidant and antihyperglycemic
32.	Capparaceae/ *Capparis decidua* (Forssk.) Edgew.	Fruit (Berry)	Hypolipidemic, antioxidant and hypoglycemic
33.	Cucurbitaceae/ *Coccinia indica* (L.) Voigt	Fruit	Hypoglycemic and insulin secretogogue
	Momordica cymbalaria Hook.f.	Fruit	Hypoglycemic
34.	Phyllanthaceae/ *Emblica officinalis* L.	Fruit	Hypoglycemic and decreases lipid peroxidation
35.	Moraceae/ *Ficus bengalensis* L.	Fruit	Hypoglycemic

36.	Apocynaceae/ *Gymnema sylvestre* R.Br.	Fruit	Antihyperglycemic and hypolipidemic
37.	Ascelpidaceae/ *Hemidesmus indicus* (L.) R.Br.	Rhizome/ Root	Anti-snake venom activity and anti-inflammatory
38.	Convolvulaceae/ *Ipomoea batata* (L.) Lam.	Fleshy Stem	Insulin resistance is decreased
39.	Rutaceae/ *Murraya koenigii* (L.) Sprengel	Leaf	Enhances glycogenesis and inhibits gluconeogenesis
40.	Musaceae/ *Musa sapientum* L.	Fruit	Antihyperglycemic, antioxidant
41.	Fabaceae/ *Phaseolus vulgaris* L.	Fruit	Inhibits alpha amylase activity
42.	Lythraceae/ *Punica granatum* L.	Fruit	Antihyperglycemic
43.	Celastraceae/ *Salacia reticulata* Wight	Fruit	Alpha glucosidase inhibitor

***Hemidesmus indicus*: A promising nutraceuticals**

Fig. 1. The plant of *Hemidesmus indicus* in its natural habitat [Photographed near Karaikal highway].

The southern Indian medicinal flora with all forms of medicinal plants having variety of biological activities has some of most used herb in form nutraceuticals. *Hemidesmus indicus* R. Br. fondly known as *Anantamul*, *Sariva*, Indian *sarsaparilla* is a well-known south Indian plant [20]. It can be seen growing very easily in common hedges and in wild condition. The root and root covering or bark finds a lot of application in traditional medicine as recorded in ancient Indian literature. This plant is placed in family Asclepiadaceae, but due to differences in the pollinical characters, the genus has been transferred to Periplocaceae family [21].

The plant of Anantamul is characteristically identified by the slender, tortuous, rigid, and cylindrical root with rust-colored and corky bark, along with quite visible furrowed with annular cracks. The leaves are opposite to one another with smooth, shiny and firm texture, and vary in morphological features like shape and size with aging. The flowers are small, externally green, and internally deep purple. Its root and root bark have a pleasant mild aroma.

C. Phytochemical screening and its application

The whole plant of *H. indicus* is loaded with phytochemicals which have some beneficial effects. Right from the bottom, with roots containing 80% of 2-hydroxy 4-methoxy benzaldehyde, a ketone, fatty acids, saponin, tannins, resinal fractions, resin acids, sterols, β-sitosterol, stigmasterol and sarsapic acid. Hemidesmin 1, hemidesmin 2, alpha-amyrin, beta-amyrin, lupeol and 2-hydroxy-4-methoxy benzoic acid have been knwon to be isolated [22]. Likewise, from the aerial part of the plant, i.e. the stem, leaves and the flowers, metabolites like terpene lactone, 3-keto-lup-12-ene-21 to 28-olide from hexane soluble fraction of ethanol extract, 4-hydroxy-3- ethoxybenzaldehyde and 3- hydroxy-4-methoxybenzaldehyde were extracted [23]. The leaves and flowers of the plant *H. indicus* is known to yield cardiac glycosides, tanins, saponins. coumarinolignoids like- Hemidesmine, and Flavonoids like- rutin, hyperoside, flavonoid glycosides and isoquercitin.

D. Antimicrobial activity

The use of *H. indicus* in Indian traditional and folklore medicine has been documented for treatment of various bacterial and fungal infections. *H. indicus* exhibited MIC against *Staphylococcus aureus, Pseudomonas aeruginosa* and *Escherichia coli.* Various organic and polar solvent extract like Chloroform, alcohol and acetone have reflected potent activity against a wide of bacterial pathogens like *Helicobacter pylori, Corynebacterium diptheriae*, *Diplococcus pneumoniae*, *Streptococcus viridans*, *and Streptococcus pyogenes.* Promising results were found against various fraction of *H. indicus* against ESβL (Extended spectrum β-lactamase) producing multidrug resistant enteric bacteria. The plant also exhibited antifungal activity against *Aspergillus niger,* and other similar class fungal

pathogens. The variety of potions and decoctions have been known as effective against *E. coli, Bacillus sp, Proteus sp., Klebsiella* sp. and *Pseudomonas* sp. [24].
The effective of *H. indicus* extracts have been also known for the dermatological disorders and skin infections. Acne vulgaris is a very common skin disorder of pilosebaceous unit of skin epithelium and is caused an anaerobic bacterium *Propionibacterium acnes, Staphylococcus epidermis* and *Malassezia furfur.* In the past researches, we have already proved that botanicals can be an effective alternative to synthetic or chemical drugs for effective cure of acne and similar topical disorders [25, 26, 27]. Similar studies conducted on extracts of *H. indicus* [28,29], had shown MIC in range of 0.051mg/ml and 1.25mg/ml against bacterium *Propionibacterium acnes,* and *Staphylococcus epidermis.* Likewise, study on methanolic fraction of *H. indicus* root [30] had shown remarkable *in vitro* antimicrobial activity against *S. typhimurium, E. coli* and *Shigella flexneri.*

E. Immuno-modulatory activity
Various alcoholic factions from *H. indicus* have shown promising immuno-modulatory activity in relation to IgG secretion and Adenosine deaminase activity. Herbal extracts promotes the release of lymphocyte driven IgG *in vitro* condition [31].

F. Antiulcer activity
The root juice or decoction from *H. indicus* has a wonderful ulcer healing effect. The immuno-protective action and selective inhibition of prostaglandins gives quick relief and fast action than standard drugs like Omperazole, rantidine [32].

II. CONCLUSION

Medicinal and aromatic plants have proven to be a source of some of the best wonder drugs. Ethnobotanical exploration of the traditional and folklore knowledge of the medicinal plants have given some of best yields in form of herbal medicine. Traditional knowledge of herbal drugs and their administration for the management of day to day ailments like fever, wound healing as well as chronic illness has a lot of potential. Traditional way of decoction, potion, extract preparation, can be improved to give a better result for the healthy body and mind. Novel approaches like phytochemical estimation, active compound chemistry, functional group analysis and green synthesis of nanoparticles through reducing chemistry has opened a new channel for herbal drug analysis. This article is a quick summary of usage of medicinal plants in treatment and cure of diseases particularly, those which have been lacking proper documented usage in modern medicine but are well known in Indian traditional medicinal system.

III. FUTURE SCOPE

Hemidesmus indicus has found a lot of application in the Southern India in day to day usage. It is used as wonderful coolant drink aka "*Nannari*" which gives quick relief from heat strokes as well as keeps the bowels at ease. The plant has a lot of potential as an antimicrobial for drug development research. Focus should be drawn on understanding the mechanism of action of active components of the plants and the physiological aspects of such inhibition.

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