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Research

A REVIEW ON INDIAN SARSAPARILLA (HEMIDESMUS INDICUS ROOT)

K. Hari prasad1*, P. Prabhavathi2, Y. Prapurnachandra3[1]

TIT - College of Pharmacy, 1Ratnam Institute of Pharmacy, Pidathapolur (V), Muthukur (M), SPSR Nellore Dt.524346 A.P., India.

2Department of Pharmaceutical Chemistry, Ratnam Institute of Pharmacy, Pidathapolur (V), Muthukur (M), SPSR Nellore Dt.524346 A.P., India.

3Department of Pharmacology, Ratnam Institute of Pharmacy, Pidathapolur (V), Muthukur (M), SPSR Nellore Dt.524346 A.P., India.

Corresponding Author:
K. Hari prasad

Email: *NA*

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Abstract:

Indian sarsaparilla (Hemidesmus indicus), a traditional medicinal plant, has been widely recognized for its therapeutic potential and diverse pharmacological activities. Native to the Indian subcontinent, this herb has been extensively utilized in Ayurveda, Siddha, and Unani systems of medicine. The plant, particularly its roots, is rich in bioactive compounds such as saponins, tannins, flavonoids, and volatile oils, which contribute to its antioxidant, anti-inflammatory, immunomodulatory, hepatoprotective, antimicrobial, and anti-diabetic properties. It has also been traditionally used as a blood purifier, diuretic, and coolant. Recent studies have explored its potential in managing chronic diseases, including cancer and metabolic disorders, due to its ability to scavenge free radicals and modulate cellular signaling pathways. This review provides a comprehensive analysis of the phytochemical composition, pharmacological activities, and traditional uses of H. indicus, highlighting its significance in both traditional and modern medicine. The paper also emphasizes the need for further research to fully explore its therapeutic potential, develop standardized formulations, and ensure sustainable cultivation practices.

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Introduction:

Herbal formulations are significantly utilized for their therapeutic uses and have become progressively popular worldwide.1 Herbal drugs or formulations have lesser side effects than synthetic formulations. The potency of herbal medicine can be improved by modern pharmacological methods . Several plants are used in the traditional medicinal system as well as modern medication system . Hemidesmus indicus is a well-known drug in the traditional medicinal system and Indian Pharmacopoeia. Hemidesmus indicus is an aromatic climbing plant commonly known as “Anantmool” or “Indian sarsaparilla”. It belongs to Apocynaceae Family. Anantmool is a combination of two words that is Anant + mool (Anant means eternal and mool means root) so Anantmool means "the external root". Various scientific studies demonstrated that H. indicus has been assigned to different families. Banerjee et al. stated that H. indicus belongs to the Periplocaceae family, Efloras et al., demonstrated the herb belongs to Asclepiadaceae family and The Plant List 2020 assigned it under the Apocynaceae family.2

But now H. indicus has belonged to Apocynaceae following phylogenetic classification . H. indicus has

two varieties black and white. The Black variety is known as Krishna Sariva and the white one is known as Sariva . It includes various phytochemical compounds like Hemindicusin, Coumarinolignoids, Hemidesmin-1, Hemidesmin-2, 2-hydroxy-4-methoxy benzoic acid (HMBA), 2- hydroxy-4-methoxy benzaldehyde (MBALD), 4-hydroxy-3-methoxy benzaldehyde (vanillin), 3-hydroxy-4-methoxy benzaldehyde (isovanillin), lupeol acetate, hindicusine and di-Oacetylhindicusine and β-amyrin palmitate 3 that possess various potential activity like anti-inflammatory, antioxidant, Analgesic, antipyretic, hepatoprotective, antileprotic, anti-acne, antimicrobial, anti-carcinogenic, antithrombotic, antihyperlipidaemic, anti-nociceptive, anti-venom and wound healing activity. All parts of Hemidesmus indicus have been considered as a crude drug but the root part of the plant displays a wide range of medicinal, biological and phytopharmaceutical properties.4 Initially, the herb was employed under the name of Smilax aspera for some time. H. indicus is considered as one of the Rasayana plant of Ayurveda. This herbal plant is utilized in the markets of the USA in the forms of polyhedral formulations as oils or creams and as oral tablets. Many types of research on the herb H. indicus have to be potentially tapped in a commercial way for the production of medicinal products.5 This review paper aims to provide whole information on the general basis, phytochemical and reported therapeutical studies of plant H. indicus.6

Description:

Habit: A slender, twining, or prostrate perennial herb with woody roots.

Root: Aromatic, long, cylindrical, and reddish-brown externally with a bitter-sweet taste. Sarsaparilla is obtained from the dried roots of several tropical species of Smilax, a member of the family Liliaceae. Some of the important spice-yielding species include S. aristolochiaefolia Mill. (Mexico), S.

Stem: Slender, branching, with nodes often rooting at the base**.** The stems of the Indian sarsaparilla (Hemidesmus indicus) plant are slender, narrow, and terete, with thickened nodes.

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Seeds: Sarsaparilla seeds come from plants in the Smilax genus, which are climbing vines often found in tropical and subtropical regions. These seeds are typically small and are enclosed in berry-like fruits. Sarsaparilla has been traditionally used in herbal medicine for its potential health benefits, such as improving skin conditions, boosting immunity, and detoxifying the body.

Leaves: Simple, opposite, ovate to lanceolate, 2-6 cm long, with a smooth surface and prominent veins**.**

Flowers: Small, greenish-purple, in axillary cymes, bisexual. Bristly sarsaparilla flowers grow in a nearly round floral arrangement called an umbel. The flowers have 5 white petals, and while numerous, the flowers are quite small, about 5 to 6 millimeters in width. The fruit are smooth, dark purple to black, and berry-like.

Fruit: A slender, cylindrical follicle containing numerous seeds with a tuft of silky hairs. The fruit are smooth, dark purple to black, and berry-like. Although they look like a blueberry, they are not edible. Bristly sarsaparilla typically grows in sunny locations and is well-adapted to droughty sites with gravelly, sandy, or rocky soils.[7]

Organoleptic Characters

Colour : Greyish Brown in colour
Odour : pleasant aroma
Taste : Bitter
Size : Length 4.20-0.65
Width 1.14- 0.7
Texture : Fine
Shape : Cylindrical

Phytochemistry

Phytochemical constituents indicate the presence of alkaloids, steroids, terpenoids, flavonoids, saponins, phenolic compounds, tannins, lignin, inulin and cardiac glycosides in HI. These phytochemicals could contribute to the anti inflammatory, antipyretic, antidiarrheal, antinociceptive, antioxidant, antithrombotic, antitumor and hepatoprotective activity of the plant .

Several phytocompounds were isolated from various parts of HI.

Root: Roots were reported to the predominant source of several phytocompounds with therapeutic values. It possesses hemidesmol, resin and glucoside, tannin and resin [7]; lupeol, β-sitosterol, α- and β- amyrins; lupeol, α-amyrin, lupeol acetate, β-amyrin acetate, hexa-Tricon ate acid, lupeol 1 octacosonal, steroid, terpenoid, flavonoid, and saponin. HI contains 80% of crystalline material glucose hemidesmol, 2 hydroxy-4-methoxy benzaldehyde, glucoside, resin acid, sterol, and tannins.

Stem: Glycosides like hemidine and indicine were isolated from the stem. Chloroform and alcohol extracts of the stem yield two pregnane glycosides, hemidescine and emidine.

Leaves: Leaf represents 2.5% of tannins. Coumarin olignoids hemidesminine, hemidesmin 1, and hemidesmin 2 were also isolated from leaves. Coumarin olignoids were new and rare group naturally occurring compound, with cytotoxic and antihepatotoxic properties.

Flowers: Flowers of HI contains glycosides, hyperoxide, Isoquercetin, and rutin.[8]

Medicinal Properties of Hemidesmus Indicus:

Antioxidant and free Radical Scavenging Activity of Hemidesmus indicus:

H. indicus has antioxidant properties that have been studied invitro using many techniques, particularly with help of FRAP assay. It was noted in previous research that H. indicus exhibited hydroxyl radical

and nitric oxide radical scavenging activities. The iron in H. indicus plays a significant role in oxygen transport, respiration, and various enzyme activities, but it is also highly reactive and can cause oxidative damage to lipids, proteins, and other cellular structures.

I. Diuretic Action: Considering that the aqueous root extract of H. indicus has a diuretic effect and increases urine production in rats, it is suggested to employ it as an adjuvant therapy to minimise the nephrotoxicity brought on by gentamicin.

II. Genitourinary Action: H. indicus is helpful in resolving urinary tract infections because it lessens the burning sensation and acts as a cooling agent. To treat urinary tract infections, it can be used with sandalwood or coriander.

III. Anticancer action of Hemidesmus indicus: H. indicus's methanolic extract has anticancer activity against the MCF7 breast cancer cell line and cytotoxic activity against the HT29 colon cancer cell line. By modifying intracellular signalling, the expression of proteins regulating cancer cell growth, and viability, it helps in inhibition of tumour cells. Cytarabine, 6-thioguanine, and methotrexate's anticancer effects are increased by H. indicus 6 .

IV. Antimicrobial Activity: Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Helicobacter pylori, Corynebacterium diphtheriae, Diplococcus pneumoniae, Streptococcus viridans, and Streptococcus pyogenes are all susceptible to H. indicus' antibacterial properties. It was shown to have excellent action against enteric bacteria that produce an extended spectrum -lactamase and are multidrug resistant. Additionally, it works against Aspergillus niger's fungus [9]

Pharmacological Aspects:

Medicinal properties of Hemidesmus indicus have been mentioned in several articles from ancient to the modern day scripts. The plant roots are used as an antipyretic, anti diarrheal, blood purifier. They are used for the treatment of blood diseases, biliousness, dysentery and diarrhoea, respiratory disorders, skin diseases, leprosy, leucorrhoea, leukoderma, itching, syphilis, bronchitis, asthma, eye diseases, epileptic fits in children, lack of appetite, burning sensation, rheumatism, kidney and urinary disorders

1. Anti-inflammatory activity:

Ethyl acetate root extract of HI exhibited anti-inflammatory activity in acute and subacute inflammation evident from the significant inhibition of inflammation caused by carrageenan, bradykinin, S-hydroxy tryptamine in rats. The extract was less active than phenylbutazone. HI root aqueous extract showed sufficient anti-inflammatory activity compared to diclofenac sodium gel. Anti-inflammatory effect of HI root ethanol extract (100, 200 mg/kg, p.o) exhibited prominent dose dependent inhibition in the experimental rat and mice models. Journal of Pharmacognosy and Phytochemistry

2. Antioxidant activity:

Methanol extracts of HI root bark exhibited inhibition of lipid peroxidation, hydroxyl, and superoxide radicals. HI extracts protected against free radical-mediated oxidative stress in the plasma, erythrocytes, and liver.

3. Anti-arthritic activity:

HI root display protective activity against arthritis, probably assigned by the presence of terpenes, sterols, and phenolic compounds in hydroalcoholic root extract and ethyl acetate fraction. These fractions showed higher anti-arthritic activity than chloroform and residual fraction. The effect of HI root ethanolic extract on osteoporosis was evaluated in ovariectomised rats and reported that it prevents bone loss in dorsal ovariectomy-induced osteoporosis without estrogen like side effects.[10]

Ayurvedic view:

Ayurvedic higher inhibitory activity against the isolated bacteria.

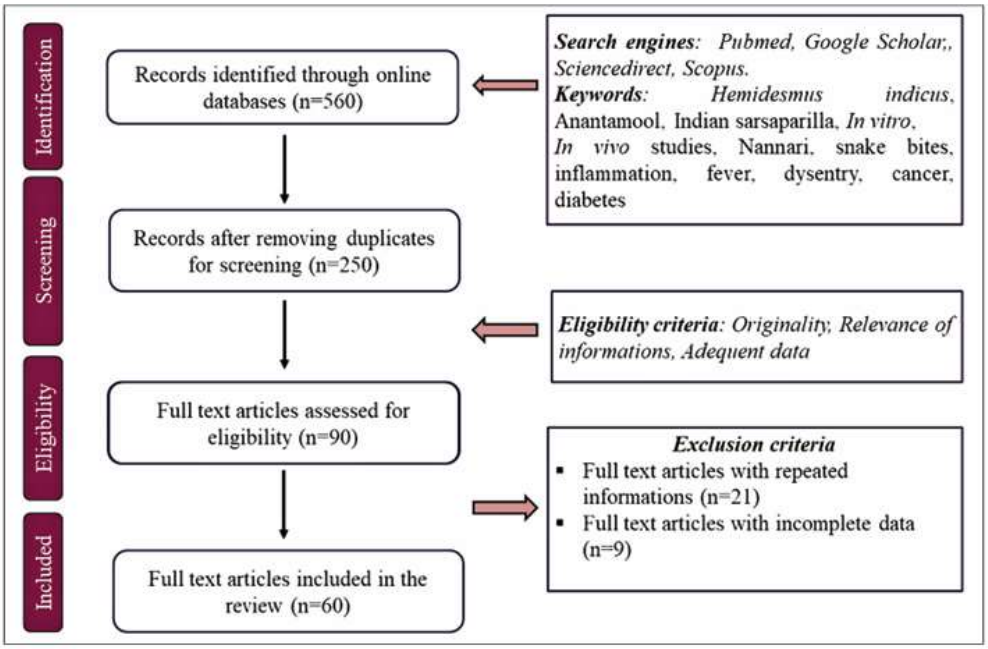
H. indicus (Anantmool) is an important therapeutic plant which belongs to the Family Asclepiadaceae that is derived from the word Askleplos. The meaning of Askleplos is “God of medicine”29. H. indicus is also known as Sariva and Anantmool is a Sanskrit synonym which means 'endless roots'30. Kulkarni et al. have been reported Anantmool as a Medhya dravya. Medhya dravya in Ayurveda means something related with the treatment of Psychological disorder31. It comprises three mental capacities i.e. Dhee, Dhriti and Smriti. All three are interrelated to each other. The researchers have

proved that H. indicus having Tridoshamaka activity and enhance "Dharan Karma" (retention). Rasa Panchaka of H. indicus (Anantmool) is s According to Charka Samhita H. indicus (Anantmool) is classified in the following groups34

- Varnya ter (Complexion enhancing drugs
- Kandhya (Beneficial for throat and voice)
- Stanyashodhan (Purifies Breast Milk)
- Purishsangrahaniya (Drugs that find maintains the motion)
- Jwarahara (anti-pyretic)
- Dhahaprashaman (Destroys burning sensation) [11]

Methodology:

The data was collected from online databases like Google Scholar, PubMed, Science Direct, and Scopus. The literature review analysis was performed with the literature of the recent 10 years. The keywords used for data collection include "Hemidesmus indicus," and "H. Indicus," "H. Indicus phytochemistry," "geographical areas," "biological activities," "pharmacological activities," "Nannari extracts," "Sariva root," "Naruneendi," "traditional uses," "home remedies," "Anantmula effects," "in vitro studies," "in vivo studies," etc. A total of 561 articles were initially identified from which 250 articles were screened after duplicate removal. Among these, 90 full-text articles were assessed to be eligible for the study. 60 full-text articles are included in the review after checking the exclusion criteria. The methodology adopted for the literature review is represented [12]



Methodology Adopted For The Systemic Analysis'

Summary

The present review discusses the research progress of H. indicus during the last 10 years. Since ancient times, the plant has been used for leprosy, piles, itching, leucoderma, skin disease, asthma, bronchitis, syphilis, paralysis, leucorrhoea, urinary disorders, dysentery, diabetes, and snake bites. The extensive uses of this folk remedy for various ailments have considered it to the commercial market as a health supplement. Various pharmacological actions of the plant have been validated through preclinical studies (Tables 2 and 3). Hemidesmus indicus is effective as an anti-inflammatory, anti-arthritic, anti-oxidant, hepatoprotective, antiulcer, anti-venom, anti hyperlipidemic, and anti-microbial agents. Even though there are many preclinical studies with H. indicus extracts, there are very few research works for identifying the phytoconstituents responsible for

the bioactivity. Preclinical studies show that H. indicus roots are effective against a wide spectrum of ailments however, the clinical data on the drug's effectiveness is very limited. More clinical studies are necessary to validate the traditional usage of this medicinal plant scientifically. The demand for novel, safe and efficient therapies is on the rise. The naturally-derived phytochemicals of medicinal value are the potential sources of the new drugs and one such source is Hemidesmus indicus. The isolated active principle compounds from this herb need to be further evaluated for their applications as chemotherapeutic and chemopreventive agents. The active compounds have molecular versatility which has to be clinically exploited. In vitro and in vivo studies need to be focussed to decipher the mechanisms of action of the active compounds. Pure compounds isolated from HI can be used for preclinical studies and consequent translation to clinical application by drug design and development. The current pharmaceutical knowledge of HI has to be potentially tapped in a commercial way for the production of therapeutic products. This article represents the pharmacological, phytochemical, ethnobotanical, toxicity, and safety guideline of this plant material. This review also displays a list of marketed formulas where H. indicus is an active ingredient. So, further investigation of this plant H. indicus which, will be helpful for the study of biological activities.

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