



***Hemidesmus indicus* COMMONLY KNOWN AS
INDIAN SARASAPARILLA- AN UPDATE**

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ABSTRACT

Hemidesmus indicus is widely used in Ayurveda for treatment of various disease conditions. It is used as a tonic, demulcent, diaphoretic, diuretic and blood purifier. The therapeutic action of the herb is due to presence of major chemical constituents like coumarinolignoids hemidesmine and hemidesmin. This herb is beneficial in skin disorders ,urinary tract infections and to treat kidney failure. Based on the scientific research the article is reviewed to reveal the therapeutic aspects of the herbal extract for the beneficial of further research.

KEY WORDS : *H.indicus* ,Ayurveda ,Urinary tract infections ,Kidney failure



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INTRODUCTION

Indian Sarsaparilla (Botanical name: *Hemidesmus indicus*) is also known as *Anantamul* in Hindi, *Nannari* in Tamil. The roots of this plant are also known as *Mahani kazangu*; especially in the South of India and in its pickled form is also served along with rice dishes.¹ In Ayurveda, this creeper vine and its roots are identified to treat ailments such as venereal and skin diseases, arthritis, rheumatism, epilepsy, nervous diseases, tonsillitis, liver disease and syphilis, stomach disorders and as an aphrodisiac to treat impotence. This herb is usually grown in the foothills of most mountainous terrains across India and is famed for its all-round medicinal and anti-oxidant properties. It mainly comprises saponins, tannins, hemidesmine, hemidesmol, hemidesterol, stearoptin, pregnane glycosides, β -sitosterol, indicusin, coumarin, volatile oils, triterpines, flavonoids¹². Syrup prepared from the roots is used as a flavoring agent and in the preparation of a sherbet which have cooling properties. people use this herb for a lots of medical issues like syphilis, urinary tract , nephritic infections. the root extract possess medicinal properties. It is used in traditional medicine. In Ayurveda it is known as Anantmula. It is also called the False Sarsaparilla. It is used in nutritional disorders, syphilis, chronic rheumatism, gravel and other urinary diseases and skin infections . Roots of *Hemidesmus indicus* possesses anti venom property. An organic acid, isolated and purified from the root extract of an Indian

medicinal plant sarsaparilla *Hemidesmus indicus* , possessed viper venom inhibitory activity. The compound isolated significantly antagonized viper venom-induced lethal, haemorrhagic, coagulant and anticoagulant activity in experimental rodents (antivenom)^{9,10}. The extracts from the root are used as a coolant and a blood purifier. Various effects of HI, such as hypoglycemic², hypolipidemic³, antioxidant, antithrombotic⁴, antiinflammatory⁵, antiulcerogenic⁶, hepatoprotective⁷, renoprotective⁸, and neutralization of viper venom^{9,10} have been reported. Hence an attempt was taken to review the pharmacological actions of *Hemidesmus indicus* extensively.

Taxonomy

Kingdom: plantae
 Division: magnoliophyta
 Class: magnoliopsida
 Order: Gentianales
 Family: *Apocynaceae*
 Subfamily: *Periplocoideae*
 Genus: *Hemidesmus*
 Species: *Hemidesmus indicus*

Common names

Anantamul (Sanskrit),
 Indian Sarsaparilla (English),
 Nunnari Asclepias,
 Periploca indica,
 Pseudosarsa

Figure 1
Hemidesmus indicus leaf & root





Morphology¹¹

Root

The roots are woody, slender or aromatic, root of the plant is used for medicinal purpose. Various research studies are done in the root extract for proving its medicinal value.

Stem

The stems and branches which twine anticlockwise are profusely laticiferous, elongate, narrow, terete and wiry of a deep purple or purplish brown colour with the surface slightly ridged at the nodes.

Leaves

Leaves of the basal parts of the shoots are linear to lanceolate. Flowers: Greenish yellow to greenish purple outside, dull yellow to light purplish inside, calyx deeply five lobed, corolla gamopetalous, about twice the calyx, Stamens five, inserted near base of corolla with a thick coronal scale.

Fruit

Fruit of Sarsaparilla are two straight slender narrowly cylindrical widely divergent follicles, Seeds many, flat, oblong, with a long tuft of white silky hairs.¹³

Cultivation

Sarsaparilla is a wild, flowering herb can successfully be grown by home gardeners from root cuttings. This plant is found throughout India growing under mesophytic to semi dry conditions in the plains and up to an altitude of 600 m. It is found in India, Sri Lanka, Pakistan, Iran, Bangladesh and Moluccas Sarsaparilla species generally grow in tropical rainforests and in hot temperate regions.^{14,15}

Phytochemical constituents

Literature indicates the presence of Alkaloids, steroids, terpenoids, flavonoids, saponins, phenolic compounds, tannins and lignins, inulins, cardiac glycosides, protein,

carbohydrates etc., in Aqueous and ethanolic *hemidesmus indicus* root extract. From aerial parts of the plant several pregnan steroids have been isolated¹⁶. Physico chemical analysis shows the total ash value of *Hemidesmus indicus* root as 3.8%, acid insoluble ash value 0.9%, water soluble ash value 1.85%. The extractive values of the plant material were 14.4% for water, 13.3% for ethanol.^{17,18} Macroscopic analysis of root is about 3.95, 0.43cm long and 0.21, 0.6mm width, cylindrical, thick and hard. Microscopic analysis of root depicts Phellem cells were characteristically dark pinkish colour, presence of radially flattened cork cells with brownish granules. Laticiferous ducts were unique. Medullary ray were mostly uniseriate. Isolation of nine pregnane glycosides viz. desinine, indicine, hemidine, indicusin, hemidescine, emidine, medidesmine, hemisine, and emicine from *H. indicus* have been reported along with certain important triterpenoids (including alpha-amyrin, beta-amyrin, lupeol, lupanone, hexadecanoic acid) and 3-hydroxy-4-methoxy benzaldehyde¹⁶. Novel pregnane glycosides denicunine and heminine, have been isolated from the dried stem of *Hemidesmus indicus*. The volatiles obtained from roots of *Hemidesmus indicus* by steam distillation contained 2-hydroxy-4-methoxybenzaldehyde and ledol, which are isolable in pure form, as the major constituents. The GC-MS analysis of the residual oil showed the presence of nerolidol, borneol, linalyl acetate, dihydrocarvyl acetate, salicylaldehyde, isocaryophyllene, a-terpinyl acetate and 1,8-cineol that are important as aromatic and bio-active principles¹⁹.

Microbial limits of H.indicus

A lower level of yeasts and molds and a limit on total aerobes are considered appropriate in plant material for topical use. The presence of aflatoxins detected by chemical means is generally independent of the number of viable molds that are detected using microbiological

methods. Aflatoxins in microgram quantity are capable of giving serious hypersensitivity reactions which can be extremely harmful to human health.

Pharmacological Aspects

Antimicrobial activity

Gayathri & kannabiran reported aqueous root extract of *H.indicus* along with barks of *F. bengalensis* and *P. marsipium roxb* showed antimicrobial activity against *S.aureus*, *P.aeruginosa*, *k.pneumoniae*²⁰.

Screening of Antibacterial activity of *H.indicus* methanolic and ethanolic root extract & vettivaria zizanoids were tested against five human pathogenic organisms .agar well diffusion method is done and *H.indicus* ethanolic root extract shows maximum zone of inhibition against *E.coli* and *V.cholerae* than other extracts tested.hence exhibits significant antibacterial activity.²¹

Antienterobacterial activity

Hemidesmus indicus root extract shows potent antienterobacteria activity. It inhibits the growth of enterobacteria and very effective against *S. flexneri*.²²

Anti acne activity

Study was carried out in terpenoidal fraction of *H.indicus* root .anti acne effect is tested against *Propionibacterium acnes* and *Staphylococcus epidermidis* which is responsible for acne vulgaris.Disc diffusion & Broth dilution method is done, MIC, MBC values suggest the extract exhibited significant anti acne effect against these organism tested.²³

Antioxidant activity

The antioxidant activity of methanolic extract of *H. indicus* root bark is evaluated in several *in vitro* and *ex vivo* models. Preliminary phytochemical analysis and TLC fingerprint profile of the extract was established to characterize the extract which showed antioxidant properties .the *in vitro* and *ex vivo* antioxidant potential of root bark of *H. indicus* was evaluated for radical scavenging activity by DPPH reduction, superoxide radical scavenging activity in riboflavin/light/NBT system, nitric oxide (NO)

radical scavenging activity in sodium nitroprusside/Greiss reagent system and inhibition of lipid peroxidation induced by iron-ADP-ascorbate in liver homogenate and phenyl hydrazine induced haemolysis in erythrocyte membrane stabilization study. The extract was found to have different levels of antioxidant properties in the models tested. In scavenging DPPH and superoxide radicals, its activity was intense , while in scavenging NO radical, it was moderate. It also inhibited lipid peroxidation of liver homogenate and the haemolysis induced by phenylhydrazine confirming the membrane stabilization activity.²⁴

Natriuretic & Saliuretic activity

H.indicus root extracts as diuretic agents is proven by a study conducted by Navanet B Gadge .A single individual dose of aqueous and ethanolic extract of *H. indicus* root (200 mg/kg and 400 mg/kg, p.o., each) were compared with frusemide and hydrochlorothiazide, (25 mg/kg, p.o., each) as reference diuretic drugs .these were administered orally to dehydrated rats. Control group rats were fed with normal saline (25 ml/kg, p.o.). All rats were caged in metabolic cages in a pair and their urine output was monitored at 5 and 24 hrs intervals. Both extracts significantly increased the urine output in higher doses. Although, the onset of this diuretic action was gradual (within 5 hrs), it lasted throughout the studied period (up to 24 hrs). Further, the intensity of diuresis induced by aqueous extract (400 mg/kg) in 5 h was almost similar to that of frusemide and hydrochlorothiazide. Aqueous extract of *H. indicus* root also caused marked increase in urinary Na⁺ and K⁺ levels.²⁵

Anti nociceptive activity

Oral administration of Hemidesmus indicus extract in mice revealed dose-dependent antinociceptive effect in all the mice models for antinociception and it blocked both the neurogenic and inflammatory pain and the nociceptive activity was comparable with the reference drug.²⁶

Renoprotective activity

Efficacy of *Hemidesmus indicus* root extract evaluated against gentamycin induced hepatotoxicity in wister albino rats 5 g/kg single dose, p.o. 90, last 6 days of treatment reduced renal impairment, induced by GM in rats.²⁷

Hepatoprotective activity

Hepatoprotective activity of methanolic root extract of *H.indicus* was evaluated by R K Goyal in paracetamol and ccl4 induced acute liver toxicity in rats.rat model which received the extract showed rise in the level of enzymes like SGOT,SGPT,ALP.but this was less when compared to rat that received ccl4 or paracetamol alone.the results of the methanolic extract of *h.indicus* were compared with standard hepato toxic drug silymarin(100mg/kg) maximum hepatoprotective effect is seen in 250mg/kg bodyweight in Ccl4 induced hepatic damage and 500mg/kg bodyweight in case of paracetamol induced liver damage,the study concludes methanolic root extract of *H.indicus* showed higher level of hepato protective activity.²⁸

Wound healing activity

A clinical study was conducted in 30 patients of chronic wounds of either sex ,the patients were kept on observation.depending upon the progress of epithelialization on complete cure it was reported that *H.indicus* root extract as applied in paste form to wounds ,showed wound healing activity.³⁰

Anti arthritic activity

Hydroalcoholic extract and ethyl acetate fraction of *Hemidesmus indicus* showed significantly higher anti-arthritic activity than chloroform and residual fraction. Histopathological analysis demonstrated that both of hydroalcoholic extract and its ethyl acetate fraction had comparable anti-arthritic activity with methotrexates.³¹

Cytotoxic activity

Study was done to evaluate the in vitro cytotoxic activity in stems of *Berberis aristata* , and rhizomes of *Hemidesmus indicus* on MCF7 breast cancer cell lines. Viability

Staining by Trypan blue dye exclusion method was followed.it shows The maximum reducing power of the *Berberis aristata* and *Hemidesmus indicus* extract at 680nm was found to be 0.997 0.081 at 1000 g/ml and 0.956 0.067 at 1000 g/ml respectively. The inhibition percentage with regard to cytotoxicity was found to be 89 % at 1000 µg/ml with IC50 value of 50+0.03 g/ml for *Berberis aristata* DC and 87 % at 1000 µg/ml with IC50 value of 48+0.02 g/ml for *Hemidesmus indicus* respectively.hence the study proves the anti cancer activity of the extract³². The molecular basis of the antileukemic effects of *Hemidesmus* and identification of the mitochondrial pathways and $[Ca^{2+}]$ as crucial actors in its anticancer activity was carried out. Anti cancer activity of *H.indicus* is performed by variety of cellular assays and flow cytometry, as well as a phytochemical screening on different leukemic cell lines. study demonstrated that *Hemidesmus* modulated many components of intracellular signaling pathways involved in cell viability and proliferation and altered the protein expression, eventually leading to tumor cell death, mediated by a loss of mitochondrial transmembrane potential and increased Bax/Bcl-2 ratio. ADP, adenine nucleotide translocator and mitochondrial permeability transition pore inhibitors did not reverse *Hemidesmus*-induced mitochondrial depolarization. *Hemidesmus* induced a significant $[Ca^{2+}]$, raise through the mobilization of intracellular Ca^{2+} stores. Moreover, *Hemidesmus* significantly enhanced the antitumor activity of three commonly used chemotherapeutic drugs (methotrexate, 6-thioguanine, cytarabine). clinically relevant observation is that its cytotoxic activity was also recorded in primary cells from acute myeloid leukemic patients.³³

Anti venom activity

Lupeol acetate isolated from the root extract of Indian sarsaparilla *Hemidesmus indicus* could significantly neutralize lethality, haemorrhage, defibrinogenation, edema, PLA2 activity induced by the *Daboia russellii* venom. It also neutralized *Naja kaouthia* venom induced lethality, cardiotoxicity, neurotoxicity and

respiratory changes in experimental animals. The methanol root extracts of *Hemidesmus indicus* and *Pluchea indica* were explored for the first time for neutralization of the snake venom (*Vipera russellii*) activity. The *H. indicus* and *P. indica* root extracts significantly neutralized the viper venom-induced lethality and haemorrhagic activity in albino rat and mouse. Venom-induced coagulant and anticoagulant activity was also antagonized by both the extracts. No precipitating bands were observed between the plant extract and polyvalent snake venom antiserum. Maximum neutralization was achieved by *H. indicus* root extract. These observations confirmed that certain Indian medicinal plants possess significant snake venom neutralizing capacity and need further examination for their active constituents.³⁴

Anti inflammatory activity

A saponin from the plant is found to have anti inflammatory activity against formalin induced edema.³⁵

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CONCLUSION

H.indicus belongs to the family *Asclepiadaceae* commonly known as indian sarsaparilla. It is a treasure of tribal & forest wealth. *H.indicus* has been ethnopharmacologically used as a therapeutic agent for a variety of diseases, as reviewed in this article. Moreover, numerous research works have proven its uses beyond the ethnomedicinal uses in experimental animals. Alkaloids and flavonoids, pregnane glycosides which were isolated from this plant may be responsible for its pharmacological activities. The birds eye point view to establish specific bioactive molecules, which might be responsible for these actions. Therefore the cultivation, collection, and further pharmacological exploration of *H.indicus* are essential.

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