



Ayurvedic And Modern Aspects of Sariva (*Hemidesmus Indicus* R. Br): An Overview

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Abstract-

Medicinal plants are being used widely, either as single drug or in combination in health care delivery system *Hemidesmus indicus* R.Br, also popularly known as ‘Anantmul’ in Marathi ‘Sariva’ in Sanskrit and ‘Indian sarsaparilla’ in english is a semi erect shrub belonging to family Asclepiadaceae. It is widely distributed throughout India. It contains various phytoconstituents belonging to the category glycosides, flavonoids, tannins, sterols and volatile oils. It is traditionally used in skin disorders, dysentery, diarrhoea, syphilis, dyspepsia, leucoderma burning sensation, chronic fever and asthma, leprosy, loss of appetite, eye diseases, epileptic disorder, dyspepsia, nutritional disorder, leucoderma, ulcer and rheumatism and used for diuretic and blood purifier purpose. Pharmacological studies carried out with its extract and purified compounds indicate that this plant possess antioxidant, hepatoprotective, anti-ulcer, antimicrobial, anticancer, hypoglycemic, antithrombotic, antihyperlipidemic, otoprotective, analgesic, anti-inflammatory and immunomodulatory activities. It also protects radiation-induced DNA damage. This review provides comprehensive and unique information regarding ayurvedic and modern aspect of sariva under one umbrella which will be helpful to researchers and pharmaceutical industries to expand the pharma worth of this wonder drug.

Key words- Sariva, *Hemidesmus indicus*, Asclepiadaceae, Anantmul

Introduction-

Hemidesmus indicus is a semi-erect shrub found throughout India from upper Gangetic plain eastwards to Assam and throughout central, western and southern India ^[1]. The name *Hemidesmus* derived from Latin word *Hemidesmos* which means half bond. It is so named in allusion to sub connate filaments at their base joint pods and connected stamens. Word *indicus* stands for of India. *Hemidesmus indicus* belongs to family Asclepiadaceae which is derived from word *Asklepos* means God of Medicine ^[2]. Vernacular name Anantmul is a Sanskrit word which means ‘endless root’ ^[3]. Plant has two varieties namely black variety, also called as Krishna Sariva and white variety which is called as Sariva ^[2] *Hemidesmus indicus* is accepted by Ayurvedic formulary as white variety whereas, *Cryptolepis buchananii* Roem and Schytt as black variety. *Ichnocarpus frutescens* is also used as black variety by the people of West Bengal and Kerala ^[4].

It is a slender, laticiferous twining shrub distributed to greater part of India. Leaves are opposite, shortly petioled, elliptically oblong to linear lanceolate. Flowers are greenish outside but purplish inside. Seeds are black, flattened with a silvery white coma ^[5].

Ayurvedic Aspect:^[6]

In Charka samhita Sariva is included in the following ganas (groups):

Varnya (complexation enhancing drugs)

Kandhya (beneficial for throat and voice)
Stanyashodhan (purifies breast milk)
Purishsangrahaniya (drugs that find faecal matter)
Jwarahara (anti-pyretic)
Dhahaprashaman (destroys burning sensation)
Madhurskandha (group of drug having sweet taste)

Types ^[7]

Krushna sariva-*Cryptolepis buchananii* Roem and Schult.

Shweta sariva- *Hemidesmus indicus* R.Br.

Synonyms ^[7]

Krushna sariva-Sariva, shyama, gopee, gopvadh.

Shweta sariva-Dhavla, sariva, gopa, gopkanya, krushodhari, sfota, shyama, gopavalali, lata, aasfota, chandana.

Vernacular Names ^[7]

Hindi-Magrabu, Salsa, Kapooree, Anantamool

Mar-Anantmool, Upalsari,

Eng- Indian Sarsaparilla **Bangal**- Anantmool

Guj-Upalsari, Kapooree, Kunder, Kagadiyo

Tel-Palsugandhi

Tami-Nannari .

Habitat ^[8]

This climbing twiner plant is found throughout India, common in Bengal, Bombay, Presidency and extending to Travancore and Ceylon.

Raspanchaka of Sariva ^[9]

Rasa -Madhur (Sweet), Tikta (Bitter)

Guna-Guru (Heavy), Snigdha (Oily)

Virya-Shita (Cold)

Vipaka -Madhur (Sweet)

Doshakarma – Tridoshashamak

Karma-

Bhavprakash nighantu ^[7]-Shukral (aphrodisiac), Tridosh-shamak (alleviates all three Doshas)

Dhanvantari nighantu ^[10]-Kanduhar (destroys itching), Raktapittahar (useful in Raktapitta disease), Kaphavatasranashanam (alleviates Kapha, and useful in Vatarakta disease), Raktapittahar (useful in Raktapitta disease)

Kaiyedeve nighantu ^[11]-Shukral (aphrodisiac) , Tridosh-shamak (alleviates all three Doshas)

Raj nighantu ^[12]- Kanduhar (destroys itching), Kaphavatsranashan (alleviates Kapha, and useful in Vatarakta disease), Durgandhunashan (destroys foul smell)

Madanpal nighantu ^[13]-Shukrakar (aphrodisiac), Tridosh-shamak (alleviates all three Doshas)

Useful parts ^[8]

Root, Root-bark and juice

Traditional Uses

Decoction of leaves of Sariva i.e. white variety of *H. indicus* was prescribed by Charaka in sallow complexion, loss of voice, cough, menstrual disorders and dysentery whereas entire plant is prescribed for treating asthma, cough, abdominal swelling and aching limbs. Krishna Sariva i.e. black variety has been indicated by Sushruta in respiratory infection and wasting diseases ^[4]. Traditionally medicated ghee

containing *Hemidesmus indicus* along with few other plants is used in chronic fever, asthma, cough, hiccup, headache, burning of body and vitiation of digestive fire ^[3]. Syrup prepared from root of *Hemidesmus indicus* was made official in British Pharmacopoeia (BP) of 1864 and is also included in Indian Pharmacopoeia. In Ayurvedic system this syrup is prescribed in dyspepsia, loss of appetite, fever, skin diseases and ulceration due to syphilis, chronic rheumatism, and leucorrhoea. It also has demulcent and diuretic properties. Infusion of root powder is used as blood purifier and possesses sudorific properties. This infusion along with milk and sugar is used in children as tonic in cases of chronic cough and diarrhoea. Parts of Anantmul, roots of Bala (*Pavonia odorata*), tubers of mustaka (*Cyperus rotundus*), ginger and kutki root (*Picrorhiza kurroa*) are prescribed by Ayurvedic experts to clear bowels and relieve fever ^[14] According to Unani system of medicine, roots and stems of *H. indicus* act as laxative, diaphoretic, diuretic and are useful in treatment of syphilis and leucoderma. In central India, a special "Herbal Mala" is made from the root pieces of Anantmul and Semal (*Bombax ceiba*) which is used in the treatment of Marasmus. The roots are used by the tribal India to cure gonorrhoea, leucoderma, bleeding piles, jaundice and dysentery. Powdered root is used in pre and postnatal care. The tribals of Rajasthan use the paste of roots in scorpion sting. Syrup prepared from roots is used for flavoring medicinal mixtures and it is often called 'Sugandha' because of the wonderful fragrance ^[15]

Medicinal Properties ^[16]

It is an alternative, diaphoretic, depurative, diuretic, immunosuppressant, aphrodisiac, refrigerant and tonic action. It is also antisyphilitic, antileucorrhoeic, galactogenic, anti-diarrhoeal, antirheumatic, febrifuge. It helps in indigestion. It improves quality and quantity of sperms. It helps in curing dyspepsia, dysentery, cough, bronchitis, leucorrhoea, uterine hemorrhage, dysuria, and blood diseases. The drug is also useful in skin diseases, fever, thirst, vomiting, poisoning, anemia, and debility

Therapeutic Uses ^[17]

Skin: Sariva mainly helpful in skin diseases. It helps in treating Pitta dosha, Erysipelas, Psoriasis, and Urticaria from heat and Eczema. It cleans the blood, reduces itching and stop supperation. The root powder is used to treat STDs that are moist and sizzling.

Urinary: It is useful in Urinary infections with dark red, gloomy, throbbing urination; cystitis, urethritis, kidney infections, prostatitis.

Nerves: Sariva is useful in nerve related diseases. Its alterative and purificatory in nature extends to the mind, hence its used in disturbed, angry or irritated emotions from high Pitta. It reduces Vata indirectly by calming the flames of Pitta.

Sariva is used in certain bacterial conditions such as Gonorrhoeal neuralgia, Syphilis, Venereal disease.

It is used in Auto immune disease such as Rheumatoid arthritis and also used in nephritic disorders.

It is also used in mouth sores of children.

The root powder (Sariva) is effective in female disorders like Pradara Roga especially in Shweta Pradar (leucorrhoea).

Modern aspect

Taxonomical Classification ^[18]

Botanical name- *Hemidesmus indicus* R.Br

Kingdom-Plantae

Subkingdom- Angiosperms

Order- Gentianales

Family- Apocynaceae

Genus- Hemidesmus

Species- *H.indicus*

Morphology

The stems and branches which coil anticlockwise are profusely laticiferous, elongate, narrow, ridged at the nodes. Leaves of Sariva are plain, petioled, opposite, complete, apiculate, sharp, dark green above however paler and sometimes pubescent below basal parts of the shoots are linear to lanceolate. Flowers Greenish yellow to greenish purple outside, dreary yellow to light purplish inside, calyx deeply five lobed, corolla gamopetalous, about twofold the calyx, Stamens five, inserted near base of corolla with a broad coronal scale. Stamens which are present near base of corolla have separate filaments and small connate quadrilateral anthers ending in inflexed appendages. Pistil bicarpellary, ovaries are open, many ovuled with distinct styles. Fruit two straight slender narrowly cylindrical widely opposite follicles. Seeds many, smooth, oblong, with a long bunch.

Chemical Composition ^[8]

It contains essential oil, Starch, Coumarin, Tannic acid, Triterpenoid saponins, Hemidesmin

Pharmacognostical studies ^[1]

Macroscopy - Dark brown roots are 30cm long and 3-8mm in diameter, cylindrical, thick, hard, sparsely branched and are provided with few thick rootlets along with secondary roots. Bark is brownish and shows transverse cracks and longitudinal fissures.

Microscopy – Transverse section of roots shows periderm consisting of three layers of tissues, cork, cork cambium and secondary cortex. Cork cells are radially flattened, rectangular and filled with dark brown contents. Cork cambium is 2 or 3 layered, compressed and is filled with deep brown contents. Secondary cortex consists of 3-4 layers of cells and contains little or no dark brown contents. Secondary phloem consist of sieve elements, parenchyma, phloem ray cells along with several scattered laticiferous ducts. Parenchyma cells are filled with starch grain and occasionally show presence of prismatic crystal of calcium oxalate. Cambium is very narrow. Xylem is transverse by narrow medullary rays. Vessels and trachieds show pitted marking. Pith is absent and central region is occupied by woody tissues.

Phytochemical studies ^[21, 22]

Phytoconstituents of *Hemidesmus indicus* ranges from hydrocarbons, glycosides, oligoglycosides, and terpenoids to steroids. The phytoconstituents isolated so far from different parts of *Hemidesmus indicus*.

Roots –Many phytochemical studies have been carried out on *H. Indicus*. From the roots of *H.indicus*, Pregnane glycoside viz. Hemindicusin, Coumarinolignoids viz. Hemidesmin-1 and Hemidesmin-2 are obtained. Others include β -amyirin acetate, α -amyirin, β -amyirin, lupeol acetate, β -sitosterol, hexadecanoic acid, hexatriacontane, lupeol octasonate. Oil contains 80% crystalline matter, glucose, hemidesmol, hemidesterol, 2-hydroxy-4-methoxy benzaldehyde, resin acid, glucoside, α -amyirin triterpene, β -amyirin triterpene, and benzaldehyde.

Stem- Glycosides such as Indicine and Hemidine, Pregnane glycoside such as Hemidescine and Emidine. Pregnane oligoglycosides viz. demicunine and heminine, Desinine, Indicusin, Medidesmine, Hemisine and Demicine, Steroidal compounds viz. Calogenin-3-o- β -Ddigitoxopyranosteroid, desminine steroid, hemisine steroid. Triterpenoids viz. 3-keto-lup-12-ene-21->28 olide triterpene, lup-12-ene-3- β -ol acetate triterpene.

Leaves- Coumarinolignoids like hemidesminine, hemidesmin1and hemidesmin 2, Flavonoids viz. hyperoside and rutin, 2.50% tannins present in the leaves.Coumaarinolignoids are new and rare group of naturally occurring compounds with cytotoxic andantihepatotoxic properties

Flowers- Flavanoid glycosides identified in the flowers of *H.indicus* were Hyperoside, Isoquercetin and Rutin.

Antioxidant activity-

In the study conducted by Ravishankara and coworkers methanolic extract of *Hemidesmus indicus* roots showed a concentration/dose dependent inhibition of 1, 1-diphenyl-2-picryl hydrazyl (DPPH) radical, superoxide radicals and moderate nitric oxide scavenging activity due to the presence of polar components. Lipid peroxidation induced by Ferric-ADP and ascorbate in rat liver homogenate was also inhibited. Haemolysis of erythrocytes by phenylhydrazine was also effectively inhibited ^[23] Similar effects were reported by Mohana and coworkers by using 50% aqueous ethanolic extract of *Hemidesmus indicus* along with hepatoprotective effect ^[24]. Topical application of cumene hydroperoxide in rats caused depletion of cutaneous glutathione and activities of antioxidant enzyme viz. glutathione reductase (GR), glutathione peroxidase (GPx), glucose 6-phosphate dehydrogenase, and catalase leading to enhanced cutaneous microsomal lipid peroxidation. Topical application of ethanolic extract of *Hemidesmus indicus* in acetone prior to application of cumene hydroperoxide showed significant inhibition of cutaneous oxidative stress and increased level of above antioxidant enzymes by an unknown mechanism ^[25] Nadana and coworkers postulated that in rats with ethanol induced nephrotoxicity, ethanolic extract of *Hemidesmus indicus* showed potent antioxidant effect and provided protection against free radical mediated oxidative stress in kidney. Administration of 500mg extract/kg of body weight/day for last 30 days of experiment significantly reduced the level of serum-urea, uric acid, creatinine and kidney-thiobarbituric acid reacting substances (TBARS), lipid peroxides and conjugated dienes. *H. indicus* extract also increased level of kidney superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), and reduced glutathione (GSH) ^[26] Kumar and coworker reported that the terpenoidal fraction obtained from successive extraction of *Hemidesmus indicus* roots possess potent free radical scavenging activity^[27]. In another study Mahalingam and coworkers showed that in streptozotocin induced diabetic rats, administration of aqueous extract of *Hemidesmus indicus* roots (500mg/kg/day) for a period of 12 weeks decreased lipid peroxidation index which is attributed to its antioxidant action ^[28].

Hepatoprotective activity -

Mookan and coworkers reported that the ethanolic extract of *Hemidesmus indicus* roots has protective effect against Rifampicin and Isoniazid (INH) induced liver toxicity. Extract (100mg/kg body weight/day, for 15 days) prevented alteration in activities of isocitrate dehydrogenase, α -ketoglutarate dehydrogenase, succinate dehydrogenase, malate dehydrogenase, cytochrome C oxidase and NADH dehydrogenase ^[29]. The authors postulated that these effects were probably due to presence of coumarino lignoids viz. hemidesmin-I and hemidesmin-II which has free radical scavenging activity Mohana and coworkers have demonstrated that 50% aqueous ethanolic extract of *Hemidesmus indicus* (400mg/kg, per orally) showed similar effects against carbon tetrachloride (CCl₄) induced liver damage. These effects were attributed to its free radical scavenging and antilipid peroxidative activities ^[25]. Similar effects were reported by Baheti and coworkers with methanolic extract of roots of *H. indicus* against carbon tetrachloride (CCl₄) and paracetamol induced liver damage. The extract of *Sariva (H. Indicus)* decreases the elevated level of serum glutamate pyruvate transaminase (SGPT), serum glutamate oxaloacetate transaminase (SGOT), alkaline phosphatase (ALP), total and direct levels of bilirubin in rats with hepatic damage ^[30]. The ethanolic extract of *Hemidesmus indicus* also showed protective effect against ethanol induced liver injury. *H. indicus* extract extensively decreased level of liver collagen and hydroxyproline content, lipid peroxidation and increases solubility of liver collagen and ascorbic acid level. The extract also decreased activities of matrix metalloproteinase-2 and matrix metalloproteinase-9 which are implicated in extracellular matrix degradation during ethanol intoxication ^[31].

Antimicrobial activity-

Hiremath and coworkers showed that chloroform and 95% ethanolic extracts of roots of *H. indicus* possess antifungal activity against *Aspergillus niger* ^[32]. Das and coworkers reported potent invitro antimicrobial activity of methanolic extract of *H.indicus* roots against *Salmonella typhimurium*, *Escherichia-coli* and *Shigella Flexneri*. The extract decreased colony forming unit (CFU)/ml in extract treated broth culture. Further the extract also inhibited castor oil induced diarrhoea in rats which was evidenced by decrease in amount of wet faeces when rats were pretreated with extract at a dose of 500-1500mg/kg. The effect might be due to inhibition of intestinal motility and by its bactericidal activity ^[33]. Das and coworkers further studied the antienterobacterial activity of both methanolic and chloroform extracts of *H.indicus*. Both the extracts inhibited growth in dose dependent manner and were found to be most effective against *S. flexneri*, moderately effective against other strains and least effective against *S. dysenteries*. This antienterobacterial activity was attributed to the presence of antimicrobial trace elements such as copper and zinc ^[34]. Das and coworkers demonstrated that glycosides obtained from *Hemidesmus indicus* inhibited adherence of *S.typhimurium* to host cell and hence reduced its pathological effect. Glycoside showed this action by mimicking host cell receptor saccharide and blocks bacterial ligands from binding to the host cell. Further, glycosides also reduced bacterial surface hydrophobicity ^[35]. Khanna and coworkers demonstrated that the aqueous extract of *H. indicus* showed larvicidal effect against *Culex quinquefasciatus* mosquito larvae which was responsible for transmission of lymphatic filariasis caused by *Wuchereria bancrofti*. Aqueous extracts showed 100% mortality at concentration of 5% on 2nd day ^[36].

Antiacne activity-

Most common skin disorder of pilosebaceous unit is *Acne vulgaris*, which is caused by bacteria *Propionibacterium acnes*, *Staphylococcus epidermis* and *Malassezia furfue*. Most of antiacne drugs target *Propionibacterium acnes*, *Staphylococcus epidermis* as they are the main culprit. In a study conducted by Kumar and coworkers, the roots of *Hemidesmus indicus* showed strong inhibitory effect on *P.acne* and *S.epidermis*. Minimum inhibitory concentration for *P.acne* and *S.epidermis* was found to be 0.051mg/ml and 1.25mg/ml. But high concentrations were required to act as bactericidal agent ^[37]. In another study conducted by Kumar and coworkers, terpenoidal fraction obtained during successive extraction of *Hemidesmus indicus* was evaluated for antiacne activity. This terpenoidal fraction showed potent antiacne activity and minimum inhibitory concentrations determined by broth dilution assay was found to be 38ug/ml for both *P. acne* and *S. epidermis* and minimum bactericidal concentrations were 38ug/ml and 46ug/ml respectively ^[27].

Anticarcinogenic activity-

Studies conducted by Sultana and coworkers showed that treatment of mouse skin with extract prior to application of cumene hydroxide prevented induction of ornithine decarboxylase activity and DNA synthesis which is considered to be a biochemical marker to evaluate tumor promoting potential of an agent. Thus extract inhibited tumor growth in mouse skin and hence can be considered as a potent chemopreventive agent ^[25] Iddamaldeniya and coworkers evaluated the decoction of *Hemidesmus indicus*, *+igella sativa* and *Smilax glabra* for its effect on diethylnitrosamine (DEN)-induced hepatocarcinogenesis. Carcinogenic potential was scored by comparing number, area and staining intensity of glutathione S-transferase placental form (GST-P) positive foci and number of cell/cm² of the positive foci in livers of rats. The decoction significantly inhibited DEN-mediated GST-P expression in rat liver and hence inhibited early DEN initiated phase of hepatocarcinogenesis. Mechanism of action of decoction was not clear but the authors hypothesized it to be either by detoxification of carcinogen, antioxidant activity, immunomodulatory action or cytotoxicity ^[38]. In another study using same decoction Iddamaldeniya and coworkers found that long term treatment of rats with decoction not only inhibited DEN induced GST-P expression but also the carcinogen mediated development of overt tumor and histopathological changes leading to tumor development. Also a marked

reduction of angiogenesis was observed in rats treated with DEN and decoction, but mechanism by which decoction inhibit angiogenesis was not clear ^[39]. Chloroform fraction containing phytosterol and fatty acid obtain from crude methanolic extract of roots of *H. indicus* was investigated by Das and coworkers for protective effect against cytotoxicity induced by *Salmonella typhimurium* in human intestinal cell lines (Int 407). Int 407 cells infected with *S. typhimurium* treated with 100ug/ml of chloroform fraction had 10 times less cytotoxicity compared to those cells which were infected by wild type bacteria. Adherence and invasive ability of *S. typhimurium* when treated with chloroform fraction to Int 407 cells was decreased by 40 times and 10-15 times respectively. Further, Int 407 cells infected with chloroform fraction treated *S. typhimurium* showed almost normal morphology with normal mitochondrial cristae. But few cells had one or two invaded bacteria and cells with altered morphology were rarely observed ^[40]. The *Hemidesmus indicus* (HI) root extract protect microsomal membranes by reducing lipid peroxidation and also protect DNA from radiation induced strand breaks ^[41].

Antithrombotic activity-

The methanolic extract of roots of *H. indicus* inhibit platelet aggregation. Intravenous administration of root extract of *H. indicus* delayed the plasma recalcification time. Further, authors also reported that the extract of *H. indicus* increased release and activation of enzymes which results in metabolic degradation of lipids ^[42]. In another study Mary and coworkers investigated the antiatherogenic effect of a polyherbal formulation called Caps HT2 having *Hemidesmus indicus* as one of the ingredient. The putative mechanism of action for the said effect is proposed to be by inhibiting platelet aggregation, delaying plasma recalcification time in rabbits and enhancing lipoprotein lipase activity ^[43].

Antihyperlipidaemic activity-

Bopanna and coworkers reported that in normal rats, cell culture extract of *Hemidesmus indicus* (CCH) administered at a dose of 16mg/kg decreased low density lipoproteins (LDL) and very low density lipoproteins (VLDL), Cholesterol and significantly increased high density lipoproteins (HDL): cholesterol ratio. In hypercholesterolemic rats, CCH administered at a dose of 2, 4 and 16 mg/kg showed significant reduction in total cholesterol, triglycerides, LDL cholesterol and phospholipids. The possible mechanism of action for the above effect can be an increase in liver LDL receptor activity with a concomitant decrease in hepatic triglyceride (TG) synthesis. Also faecal excretion of cholesterol and phospholipids were increased in hypercholesterolemic rats after administration of CCH (4 and 16 mg/kg) ^[43]. As mentioned above the polyherbal formulation Caps HT2 was also found to possess hypolipidemic activity as it raised HDL cholesterol level in hyperlipidemic rats ^[44]. In another invivo study Anoop and coworkers proposed that 2-hydroxy-4-methoxy benzoic acid (HMBA) present in *Hemidesmus indicus* may be responsible for its antihyperlipidemic action. Administration of HMBA 200ug/kg/day for 30days after oral administration of ethanol for 30days to rats decreased plasma total cholesterol, TG, lipoproteins, phospholipids, free fatty acids and increased plasma lipoprotein lipase concentration ^[45].

Antienterobacterial activity

It inhibits the growth of enterobacteria and very effective against *Hemidesmus indicus* R.Br. Root extract shows potent anti-enterobacteria activity ^[46]

Natriuretic and Saliuretic activity

Hemidesmus indicus R.Br. root extracts as diuretic agents is proven by a study conducted. A single individual dose of aqueous and ethanolic extract of *Hemidesmus indicus* R.Br. 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. Even though, 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 *Hemidesmus indicus* R.Br. root also caused marked raise the level of urinary Na⁺ and K⁺ levels ^[47].

Renoprotective activity

Efficacy of *Hemidesmus indicus* R.Br. 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 genetically modified (GM) in rats ^[48]

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 ^[49]. It was reported that *Hemidesmus indicus* R.Br. root extract as applied in paste form to wounds, showed wound healing activity ^[50].

Anti-arthritic activity

Hydroalcoholic extract and ethyl acetate fraction of, *Hemidesmus indicus* R.Br. showed extensively higher anti-arthritic activity than chloroform and residual fraction. Histopathological analysis demonstrated that equally hydroalcoholic extract and its ethyl acetate fraction had equal anti-arthritic activity with methotrexates ^[51]

Anti inflammatory activity-

A saponin from the plant is found to have anti inflammatory activity against formalin induced edema ^[52]

Anti venom activity-

Lupeol acetate isolated from the root extract of *Heidesmus indicus* R.Br. can radically neutralize lethality, haemorrhage, defibrinogenation, edema, PLA2 activity induced by the *Daboia russellii* venom ^[50]. It also neutralized lethality, cardiotoxicity, neurotoxicity and respiratory changes in experimental animals. The methanol extracts of *Hemidesmus indicus* R.Br. root were explored for the first time for neutralization of the snake venom (*Vipera russellii*) activity ^[53].

Antinociceptive ^[54].

Ethanol extract dose dependently counteract both neurogenic and inflammatory pain

Toxicity Studies ^[55]

H. Indicus var. pubescens administered by gastric intubation, at 1000 and 2000 mg/kg dose levels, showed stimulative effect. But depressive effect like sedation and analgesia was noticed above 3000 mg/kg dose level. At 400 mg/kg dose level there were abnormal secretion from the mouth and the animals showed hypnosis. There was no marked difference in gross behavioural and acute toxicity study between seasonal samples. Since all animals were alive up to 4000 mg, LD 50 could not be ascertained for oral route. Acute toxicity for VP by intra-peritoneal routes, 1,3,5,7 and 9 animals died at 500, 750, 1000, 1250, and 1500 mg respectively and all were dead at 1750 mg dosage LD50 was found to be 848.3 ± 8.93 mg/kg. FP at 500, 750, 1000, 1250 and 1500 mg levels, 4,6,7 and 8 animals died respectively and at 1750 mg all were dead. LD 50 was calculated as 813.7 ± 8.57 mg/kg.

Conclusions

Sariva (Indian sarsaparilla) is commonly found throughout India and is widely recognized in traditional system of medicine. Various pharmacological studies carried out have demonstrated the potential of this plant as an anti-inflammatory, antimicrobial, Antinociceptive, Antienterobacterial activity, anti-oxidant, antiatherogenic and anti-carcinogenic agent. From ancient period Sariva have been used in Ayurveda as a curative agent for variety of ailments like Skin disorders, Pittaj Jwar, Raktapitta, Luecorrhoea, urinary infections, Dysentery etc. Due to its attributes of Madhur, Tikta Rasa; Madhur Vipak, Sheet Veerya and Guru, Snigdha gunas; it performs actions such as Tridoshshamak but mainly Pittashamak, Varnya, Purishsangrahnaya etc. The plant has become an endangered species now and hence one needs to focus on the agricultural and climatic needs of this plant, which favours its growth and survival. Moreover there is need to explore its hidden potential by conducting extensive research work on this depleting wealth for the benefit of mankind.

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