

Hemidesmus indicus: A Rich Source of Herbal Medicine

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Abstract

Herbal medicines vary in a large range; from traditional medicines of ancient times to present day standardized herbal extracts. Herbal medicine is used for primary health care by about 80% of world population. In 1991, World Health Organization developed guidelines for assessment of herbal medicines. Different archaeological evidences indicate that medicinal plants are used approximately five thousand years ago. Whether it is Mesopotamians, Egyptians or China dynasty; Indian ancient Ayurveda too carries the evidences of use of herbal medicines 5000 BC. *Hemidesmus indicus* – Anantamool, is a plant species of Apocynaceae family commonly found in India, specially in different areas of West Bengal. It is a slender, laticiferous, semi-erect endangered shrub; specifically known for its immense medicinal values; for example-anticancerous, antiarthritic, antimicrobial, antiulcer, antivenom, antileprotic, immunomodulatory, hepatoprotective, wound healing activity etc. Its immense medicinal values can bring *H. indicus* as a royal source of herbal medicine in India.

Keywords: Herbal medicines; Ancient ayurveda; Medicinal plants; *Hemidesmus indicus*; Medicinal properties

Introduction

Herbal Medicines use different alkaloids of medicinal plants for prevention and treatment of disease. It varies in large range; from traditional medicines of ancient times to present day standardized herbal drugs. In the age of clinical medicines, main blockage to use clinical drugs is drug resistance. So, multidrug resistance somehow hampers random use of clinical medicines anymore; putting forward more use of herbal medicine. Use of herbal medicine is cheaper for its easy availability. Modern day medicine already accepted herbalism as a form of alternative medicine. Clinical medicines however use many plant-derived metabolites in pharmaceutical drugs, for example- opium, aspirin, digitalis, quinine etc; but scope of using herbal medicine is more extended as it consists of many more unexplored herbs, minerals, fungal and algal products.

History of herbal medicines

Different archaeological evidences indicate use of medicinal plants approximately five thousand years ago. Mesopotamians in 3100 BC listed many plants for their medicinal uses. Also in ancient Egypt, herbs are mentioned in Egyptian medical papyri, where on rare occasions medical jars found containing trace amounts of herbs [1]. The earliest known Greek herbal medicines were those of Diocles of Carystus, written during 3rd century BC and one more by Krateuas in 1st century BC [2]. Seeds were likely to be used as herbal medicines; have been found in archaeological sites of Bronze Age China of Shang Dynasty [3]. More than hundred of 224 drugs mentioned in Huangdi Neijing, an early Chinese medical book, were herbs. Ayurveda is traditional medicine system of Hindu Vedic tradition. The samhita of the *Atharvaveda* itself contains 114 hymns about magical cure of diseases. Origin of Ayurveda has been traced back to 5,000 BC, originating as an oral tradition and later as medical texts. There are two principal early texts on ayurveda: the Charaka Samhita and the Sushruta Samhita. Underwood & Rhodes (2008) mentioned early phase of traditional Indian medicine identified “fever, cough, diarrhea, tumours, and skin diseases (including leprosy)”[4]. Plastic surgery, couching (a form of cataract surgery), puncturing to release fluids in abdomen, treatment of anal fistulas, treating fractures, amputations, cesarean sections and stitching of wounds were known [4]. Ayurveda points use of plant-based medicines and treatments. Plant-based medicines are derived

from root, leave, fruit, bark and seed parts of plant. In some cases, alcohol was used as a narcotic for patients undergoing operation [4].

Present day scenario and importance of herbal medicines

Herbal medicine is used for primary health care by about 80% of world total population. In 1991, WHO developed guidelines for assessment of herbal medicines. The turnover of herbal medicines in India as classical formulations and home remedies of Ayurveda, Unani and Siddha medicine system; is about \$1 billion with a meagre export of about \$80 million. Psyllium seeds and husk, castor oil and opium extract alone account for 60% of total exports. Two of the ten most widely selling herbal medicines in developed countries, namely *Allium sativum* and *Aloe barbadensis* are both available in India. India is one of the 12 mega biodiversity nation having two of the 18 biodiversity ‘hotspots’- the eastern Himalaya and the Western Ghats, over 45,000 plant species of which 4900 are endemic to the country, 23,000 fungi, 2500 algae, 1600 lichens, 1800 bryophytes and 16 different agroclimatic zones [5]. The future medicinal system solely depends on alternative medicine, specifically plant-derived herbal medicines; as it is less toxic and having fewer side effects. Common medicinal plants that are used hugely, are- *Hemidesmus indicus*, *Zingiber officinale*, *Rauvolfia serpentina*, *Swertia chirayita*, *Cassia angustifolia*, *Acorus calamus*, *Adhatoda vasica*, *Aconitum species*, *Picrorhiza kurroa*, *Colchicum luteum*, *Rheum emodi* etc. In traditional systems of medicine, the drugs are primarily dispensed as water or ethanolic extract. Fresh plant parts, juice or crude powder are also available. Thus medicinal plant parts should be authentic and free from harmful materials like pesticides, heavy metals, microbial or radioactive contamination. The bioactive extract should be standardized on the basis of active principle

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or major compounds along with fingerprints. The next important step is stabilization of the bioactive extract with a minimum shelf-life of over a year. The stabilized bioactive extract should undergo regulatory or limited safety studies in animals.

***Hemidesmus indicus*, as a Medicinal Plant**

H. indicus – Anantamool, is a plant species of Apocynaceae family commonly found in India, specially in different areas of West Bengal. It is a slender, laticiferous, semi-erect endangered shrub; specifically known for its immense medicinal values.

Antiarthritic activity

H. indicus root has protective activity against arthritis and the activity is might be attributed by presence of terpenes, sterols and phenolic compounds in hydroalcoholic root extract, as well as in ethyl acetate fraction [6].

Anticancerous activity

Methanolic root extract of *H. indicus* have remarkable anticancer potentials against MCF7 Breast cancer cell line, cytotoxic effect against HT29 colon cancer cell line and Ehrlich Ascites Tumor too [7-9]. Moreover, it significantly enhanced antitumor activity of three commonly used chemotherapeutic drugs- methotrexate, 6-thioguanine, cytarabine [7].

Antimicrobial activity

H. indicus is traditionally used in Indian folklore medicine for treatment of various bacterial and fungal infections. *H. indicus* showed Maximum zone of inhibition against *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Escherichia coli*. Chloroform extract of *H. indicus* showed promising activity against clinical isolates of *Helicobacter pylori*. 95% ethanolic extract and aqueous extract both were shown to be effective against *Corynebacterium diphtheriae*, *Diplococcus pneumoniae*, *Streptococcus viridans*, and *Streptococcus pyogenes*. It was found that acetone, ethyl acetate and methanol fraction of *H. indicus* demonstrated high activity against ES β L (Extended spectrum β -lactamase) producing multidrug resistant enteric bacteria. The chloroform and 95% ethanol extracts of *H. indicus* showed antifungal activity against *Aspergillus niger* too. Clinical trials of “RENALKA” syrup [containing extracts of *Tribulus terrestris*, *Crataeva magna*, *H. indicus*, *Cyperus rotundus*, *Vetiveria zizanioides*, *Asparagus racemosus* and *Elletaria cardamomum* and Trikatu] is done for effectiveness in curing and relieving Urinary Tract Infection symptoms. The drug was found to be safe and effective against *E. coli*, *Bacillus sp*, *Proteus sp.*, *Klebsiella sp.* and *Pseudomonas sp.* [8].

Antidiarrhoeal activity

H. indicus methanolic extract elicited significant antidiarrhoeal activity than standard drugs. It was found that *H. indicus* aqueous extract increase water absorption and Na⁺-K⁺ from jejunum [9].

Anti-inflammatory effect

It is found that ethyl acetate extract of *H. indicus* root shows much anti-inflammatory effect in acute and subacute inflammation. Oral administration of *H. indicus* root extract blocked both neurogenic and inflammatory pains. Comparative studies on anti-inflammatory activity of *H. indicus* are also done in carrageenan-induced rat paw oedema. The ethanolic extracts of roots exhibited significant anti-inflammatory activity at a dose of 350 mg/kg p.o. as compared to control [10].

Antileprotic activity

H. indicus root aqueous extract was orally administered at 2% concentration in mice. Mice were infected with *Mycobacterium leprae* and observed that cutaneous hypersensitivity stimulation was delayed. It also had immunomodulatory and immunosuppressant activities. Phagocytosis was too decreased [11].

Antioxidant and free radical scavenging activity

Doxorubicin (Dox) is an anthracycline antibiotic widely used in treatment of cancers including hematological malignancies, many carcinomas and soft tissue sarcomas. However, the clinical use is restricted due to its toxicities to cardiac tissues. The Dox-induced cardiotoxicity is shown to be mediated by lipid peroxidation, free radical formation, mitochondrial damage and decreased activity of Na⁺-K⁺ ATPase. Antioxidant enzymes-SOD, CAT and GPx, as well as GSH levels in heart tissue decreased drastically after doxorubicin injection. *H. indicus* root extract, due to its antioxidant properties significantly reduced the oxidative stress and thereby toxicity induced by doxorubicin. 70% methanolic extract of *H. indicus* root, which contains large amounts of flavonoids and phenolic compounds, exhibits high antioxidant and free radical scavenging activities. It also chelates iron and has reducing power. These in vitro assays indicate that the extract contains constituents that can be a significant source of natural antioxidant [12].

Antivenom activity

H. indicus root extracts effectively neutralized Viper venom induced lethal, haemorrhagic, coagulant, anticoagulant and inflammatory activity. Lupeol acetate isolated from *H. indicus* root extract significantly neutralizes lethality, haemorrhage, defibrinogenation, and edema; induced by *Daboia russellii* venom. It also neutralized *Naja kaouthia* venom induced cardiotoxicity, neurotoxicity and respiratory issues in experimental models [13]. Methoxy benzoic acid of *H. indicus* root particularly has antivenom potential.

Hepatoprotective activity

Oral administration of 50% ethanolic *H. indicus* root extract significantly prevented rifampicin and isoniazid induced hepatotoxicity [14]. CCl₄ and paracetamol induced hepatic damage can be cured upto an extent too by *H. indicus* root extract. Biochemical parameters, like-Alkaline phosphatase, SGOT, SGPT were found to be in normal range only after oral administration [14].

Nootropic Effect

n-butanol fraction of ethanolic root extract of *H. indicus* significantly improved learning power and memory at mice. Hence, *H. indicus* proved to be a useful memory restorative agent in treatment of dementia seen in the Alzheimer's disease and other neurodegenerative disorders [15].

Wound healing activity

Leaves of *H. indicus* possess marked wound healing activity and play a promising role in treatment of wounds, especially chronic wounds of diabetic and cancer patients. Alcoholic *H. indicus* root extract, formulated as 5% and 10% ointment increase rate of wound contraction and period of epithelisation [16].

Conclusion

In India, more than 70% of total population use herbal drugs for

health issues. There are vast experience-based evidences for many of these drugs. Large numbers of Institutes or Universities are there too in India, carrying out research on herbal drugs and medicinal plants. In order to ensure quality and safety of herbal medicines; their production and sale should be legally controlled, as done for clinical medicines, by establishing rules and regulations. Also more research must be carried on toxic side effects of using any herbal drugs. All these safety measurements can establish alternative medicine- herbal drugs in a better future scenario.

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