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Review Article

An overview of traditional and biological perspectives of *Sidacordifolia* Linn

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Abstract

Herbal drugs constitute a major share of all the officially recognized systems of health in India viz. Ayurveda, Yoga, Unani, Siddha, Homeopathy and Naturopathy. The herbal products today symbolize safety in contrast to the synthetics that are regarded as unsafe to human and environment.*Sidacordifolia L.*inn belonging to family Malvaceae is widely distributed throughout the plains of India Malvaceae, commonly known as *Bala*, is an Ayurvedic medicine that isused to treat bronchial asthma, cold and flu, chills, lack of perspiration, head ache, nasal congestion, aching joints and bones, cough and wheezing, and edema. It has wide variety of therapeutic and pharmacological uses like analgesic, anti-inflammatory, anti-stress, anti-diabetic along with anticancer activity. Apart from these it also has many uses like emollient action, demulcent, bronchodilator, vaso-relaxant properties etc. Due to all of these properties this plant is one of the cornerstones in ethnopharmacology and ethanobotanical sciences.

Keywords: Unani,*Sidacordifolia* Linn, Malvaceae, analgesic, ethnopharmacology

INTRODUCTION

India is rich source of medicinal plants and is called "Botanical Garden of the World" with enormous wealth of biodiversity. According to WHO, 80% of world's population rely on traditional plant based medicines for their health care.*Sidacordifolia L.* commonly known as Country Mallow is a herb belongs to Malvaceae family is widely distributed throughout the tropical and subtropical regions of India. It is also known as the "Bala" in Hindi and Sanskrit. (1) The plant name Bala is coined on the name of 'Parvati' (goddess of strength and beauty).There are almost 45,000 plant species recorded in India so far (MOEF, 1994) of which 7,500 species have been used for medicinal purposes (2). It is also used in the traditional medicine systems in China, Brazil and other countries for a widerange of illnesses. The traditional indications of bala include antirheumatic, antipyretic, analgesic, antiasthmatic, laxative, diuretic, hypoglycemic, as a nasal anticongestant (4-6), and as a pain reliever in sciatica (7).The quantities are low, with less than 2% of ephedrine and pseudoephedrine found in the leaves of *Sidacordifolia*. Ephedrine is known to stimulate the central nervous system (CNS), and as such can enhance weight loss. Traditionally nutrition companies used plants such as *Ma-Huang* (Ephedra plant), because it contained relatively large amounts of ephedrine, in their weight loss products. However, since this product was banned in many countries including the USA and UK, they are now looking for alternatives. *Sidacordifolia,* with its ephedrine and pseudoephedrine has gained a lot of interest and is now sold by many of these companies (8).

Scientific Classification

- Kingdom - Plantae
- Division – Angiospermae
- Class - Eudicots
- Order – Malvales
- Family - Malvaceae
- Genus - Sida
- Species - *Sidacordifolia*

Vernacular names

- Hindi - Kungyi
- English - Country mallow
- Sanskrit - Bala
- Tamil - Mayir-manikham
- Bengali - Brela
- Guajarati - Junglimethi
- Malayalam - Velluram
- Punjab - Simak
- Maharashtra – Chikana

Botanical description

Sidacordifolia grows well through the plains of India, especially, in damp climates. The shrub grows up to 0.75 – 1.5 meters in height. The root and the stem are stout and strong. The leaves are 2.5-7 cm long and 2.5-5 cm broad, with 7-9 veins. They are heart shaped, serrate and truncate. The flowers are small, yellow or white in colour, solitary and axillaries. The fruits are moong-sized, 6-8 mm in diameter. The seeds are called as Bijabanda in Ayurveda, are grayish black in colour and smooth. The plant flowers from August to December and fruiting occurs from October to January (9).

Ethanopharmacology

It has a long history of use by Ayurveda and rural area particularly for medicinal properties. It is in use as folk medicine in India since time immemorial. According to Ayurveda, the plant is tonic, astringent, emol-

lient, aphrodisiac and useful in treatment of respiratory system related troubles. Bark is considered as cooling. It is useful in blood, throat, urinary system related troubles, piles, phthisis, insanity etc. (10). The roots of *S. cordifolia*are administered as a curative agent for nervous disorders such as facial paralysisand hemiplegia, as well as in urinary disorders (11-13). The root bark is exploited as stomachic, demulcent, tonic, astringent, bitter, diuretic, aromatic, and as antiviral agent (14). Leaves are cooked and eaten in cases of bleeding piles. Juice of the whole plant, pounded with a little water is given in doses of ¼ seers for spermatorrohea, rheumatism, and gonorrhoea. Made into pastewith juice of palmyra tree, it is applied locally, in elephantiasis (15). The seeds of *S. cordifolia*are traditionally used as aphrodisiac and also indicated in the treatment of gonorrhea, cystisis, piles, colic and tenesumus. Thepharmacological examination showed that seeds cause elevation of blood pressure in anesthetized animals [16] It is also reportedly indicated in Brazilian traditional medicine as antirheumatic, antipyretic [14] laxative, diuretic, anti-inflammatory, analgesic and hypoglycaemic [19], antiviral [17], antimicrobial [18], and as aphrodisiac [20]. In China, S. cordifolia is considered as a herbal equivalent of Ephedra [14], while in Kenya it is utilized for dental hygiene.

Pharmacology

Gastric anti-ulcer activity

The ethanol extract of leaf of Sidacordifolia screened for gastric anti-ulcer activity with L. The ulcers were induced in 36hours fasted albino rats by pylorus ligation model, ethanol (1ml/kg) and aspirin (300 mg/kg) induced gastric lesions and comparison made with reference drug famotidine at dose level (20 mg/kg). The plant extract of *Sidacordifolia.* L. (100 and 200 mg/kg, b.wt) exhibited potent anti-secretary volume, acidity and ulceration, thus, establishing significant antiulcer activity against different ulcer induced models(21).

Anti-inflammatory and Analgesic Effects

The ethyl acetate and methanol extracts of the root of S. cordifolia, when tested in rats, using the carrageenan-induced edema model, both produced anti-inflammatory effects. Nevertheless, the effect of the ethyl acetate, at a dose of 600 mg/kg, was equivalent to that of indomethacin. In addition, the ethyl acetate extracts of the aerial parts and root of this species exhibited substantial central and analgesic activity, employing the acetic acid induced writhing and hot plate methods [13]. In another work [22], the methanol extract of S. cordifolia showed significant antipyretic and antiulcerogenic properties [23]. An aqueous extract of S. cordifolia leaves was examined in animal models for their pharmacological properties and found to possess anti-inflammatory and analgesic functions, with low acute toxicity in mice. Some experimental evidence suggested the latter effects are mediated via interference with cyclooxygenase pathways (24)

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Antidiabetic and Antihypercholesterolemic Effects

A recently published article described a study on the effect of methanol and aqueous extracts of *Sidacordifolia* on oral glucose tolerance test (OGTT) in addition to investigating the action of the aqueous extract on streptozotocin-induced diabetic rats in comparison with the clinically used drug metformin. The study revealed that administration of methanol extract or aqueous extract to normal rats resulted in reduction of the serum glucose level on days 7, 14, and 21, in a dose dependent manner. The maximum decrease in serum glucose level was observed with the aqueous extract at a dose of 1 g/kg. When the aqueous extract (1 g/kg, b.w.) was orally administered in the streptozotocininduced diabetic model, a noticeable reduction in the serum glucose level was observed on days 7, 14, and 21, with concomitant improvement in the lipid profile, glycogen content, and gain in body weight [25]. In another account, it was found that the methanol extract of S. cordifolia root elicited a substantial hypoglycemic effect, when orally administered at a dose of 600 mg/kg to rats [13].

Wound Healing Properties

An ointment made of ethanol extract of *Sidacordifolia* was shown to accelerate wound contraction, and increase tensile strength of excision, incision and burn wounds in rats. In this study [26], the parameters indicating wound healing, including wound contraction, epithelialization period, hydroxyproline content, tensile strength, and histopathological features were compared with the effect of the standard drug, in this case silver sulfadiazine.

Antiproliferative and Antioxidant Activities

Methanol extract of S. cordifolia when tested in vitro on HepG-2 cells, it exhibited significant antiproliferative activity after 48 h of contact with the cells. In addition, the same extract was demonstrated to elevate the activity of the antioxidant enzymes, superoxide dismutase, catalase, and glutathione S-transferase after 48 h [27].

Antidiabetic and Antihypercholesterolemic Effects

A recently published article described a study on the effect of methanol and aqueous extracts of Sidacordifolia on oral glucose tolerance test (OGTT) in addition to investigating the action of the aqueous extract on streptozotocin-induced diabetic rats in comparison with the clinically used drug metformin. The study revealed that administration of methanol extract or aqueous extract to normal rats resulted in reduction of the serum glucose level on days 7, 14, and 21, in a dose dependent manner. The maximum decrease in serum glucose level was observed with the aqueous extract at a dose of 1 g/kg. When the aqueous extract (1 g/kg, b.w.) was orally administered in the streptozotocininduceddiabetic model, a noticeable reduction in the serum glucose level was observed on days 7, 14, and 21, with concomitant improvement in the lipid profile, glycogen content, and gain in body weight [25]. In another account, it was found that the methanol extract of S. cordifolia root elicited a substantial hypoglycemic effect, when orally administered at a dose of 600 mg/kg to rats [13].

Anti-parkinsonism

Neuroprotective effect of *Sidacordifolia* L. root powder in Parkinson mice model was carried out by by

MPTP method. They reported that neurochemical levels, antioxidant status and behavior patterns were significantly improved. It was reported ashwagandha and *Sidacordifolia* L. are prime herbs used in Parkinson's disease in ayurvedic treatment.(28)

Anticancer activity

The ethanolic extract of *Sidacordifolia*against Aflotoxin B_1 (AFB_1) induced hepatocellular carcinoma (HCC) was evaluated in in winstar rats (250µg/ kg/ dose). The ethanolic extracts of *Sidacordifolia*was administered at a dose of 250 and 500 mg/kg orally. The results showed a significant restoration of abnormal serum and tissues indicating the protective effect(29).Anticancer activity for the plant alkaloid cryptolepine from *Sidacordifolia*was investigated. The results showed that cryptolepine induces growth arrest in MG63 cells through the p53-independent activation mediated through specific Sp1site in promoter region. It indicates the possibility that treatment with cryptolepine can be used as chemotherapy for osteosarcoma.(30)

Hepato protective activity

Liver regeneration analysis of *Sidacordifolia L.*. was investigated after partial hepatectomy in male wistar albino rats. The aqueous extract of *Sida cordifolia*L.in the doses of 100mg/kg and 200mg/kg, the hepatocyte regeneration index was significantly increased at low dose when compared to control group ($p< 0.001$) and the high dose also showed a significant increase in regeneration rate in comparison to control group ($p<0.05$).It can be concluded that *Sidacordifolia L.*. can exhibit a key role in the hepatocellular synthesis of DNA and in liver regeneration process(31). The antihepatotoxic activities of various extracts of the roots of *Sidacordifolia L.*. against carbon tetrachloride intoxicated rats was studied. The methanolic extract exhibited marked protection evidenced by serum biochemical parameters and histological examination(32)

Cardiovascular activity

The cardiovascular activity of the hydroalcoholic extract of *Sidacordifolia* was studiedat a concentration of (5, 10, 20, 30 and 40 mg/kg) induced hypotension and bradycardia in normotensive non-anaesthetized rats. It could be due to indirect cardiac muscarinic activation and direct activation of endothelial vascular muscarinic receptors by using atropine (2mg/kg). The effect of hydroalcoholic extract of *Sidacordifolia* (HESC)was also studied on serum lipid profile. It was concluded that administration of HESC at dose of 500 mg/kg has cardio protective potential. (33-34)

Conclusion

*Sidacordifolia*is prescribed in traditional medicine in India, China, Brazil and othercountries for a wide range of indications including bronchitis, asthma, nasal congestion, inflammation of oral mucosa, rheumatism, neurodegenerative diseases, chronic dysentery, and gonorrhea. The leaves, aerial parts and roots are used in the traditional system of medicine for various diseases related to the human race. Additionally, it possesses antiviral, analgesic, antipyretic, laxative, diuretic, and aphrodisiac properties, and is also used as a hypoglycaemic agent. This plant has great potential to develop the Ayurvedic, modern medicine and athletic supplements by pharmaceutical industries. The present review also reports the various pharmacological potentials which are explored by various researchers. Yet more biological potentials are still untapped.

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