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SIDA CORDIFOLIA- A SYSTEMIC REVIEW

Mohd. Imran[1], Anil Kumar Sharma[1] and Sanchit Sharma[1]*

[1]Aimil Pharmaceuticals New Delhi (India)-110028.

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***Corresponding Author**
Sanchit Sharma
Aimil Pharmaceuticals New Delhi (India)-110028.

ABSTRACT

Sida cordifolia or Bala is a well-known constituent of Ayurvedic herbal medicine in many countries including India. Various parts of the herb have been used as hypoglycaemic, diuretic, analgesic, antirheumatic, antiviral, antipyretic, laxative, antiasthmatic, hepatoprotective, and anticongestant. It has also shown benefits for the management of Parkinson's disease. To assess this conventional plant from a contemporary standpoint, the present review covers taxonomy, distribution pattern, chemical contents, and pharmacological investigations of constituents, herbal usages, toxicity, and side effects. The chemical constituents present in the herb include fatty acids, flavonoids, sterols, alkaloids, and phytoecdysteroids which make it a potential candidate in modern medicine. This review also examines the contradicting factors of ephedrine and addresses the alleged efficacy of S. Cordifolia along with the interactions with other medications based on the existing research.

KEYWORDS: *Sida cordifolia*, Bala, pharmacology, Malvaceae, Ayurveda.

INTRODUCTION

The chemical and medicinal components of plants and their extracts in their natural condition play a crucial role in modern medicine. The secondary metabolites are an important source of structural moieties that collaborate to cause a range of biological effects.[1]

Metabolites are only tiny molecules and are the intermediate by-products of metabolism. Plants create a large number of compounds that fall under the categories of primary metabolites and secondary metabolites. Primary metabolites are always present and essential for cell function. Because of their many uses, secondary metabolites are beneficial to humans.

There are over 200 species of the genus *Sida* spread throughout the world's tropical and subtropical regions.(1-s2.7854).[2]

Sida cordifolia L., the botanical name for "Bala," is a member of the Malvaceae family. Due to the plant's extensive medical benefits, Ayurvedic, Siddha, Homeopathic, and modern allopathic physicians are interested in it. Even a few pharmaceutical firms have started marketing "Bala"-based slimming capsules.[3]

According to traditional medical texts, *Sida cordifolia* has antispasmodic, anti-inflammatory, hypoglycemic, hepatoprotective, and analgesic properties. This plant is employed in the treatment of bronchial asthma, nasal obstruction, skin conditions, urinary tract infections, obesity, cardiac conditions, bleeding hemorrhoids, and the creation of analgesic massage oils. According to Kirtikar and Basu, *Sida cordifolia* is effective for treating a variety of conditions, including arrhythmia, hemiplegia, sciatica, neuritis, neuralgia, epilepsy, rheumatism, anorexia, fatigue, impotence, gonorrhea, cystitis, leucorrhea, urinary frequency, diabetes, diarrhea, dysentery, and hemorrhage. This species can be found in tropical and subtropical areas of India and Sri Lanka.[4]

Sida cordifolia is an upright perennial that can reach heights of 50–200 cm. The 3.5 cm long, oblong, hair-covered leaves are shaped like swords. The trunks are stout, long, short, and greenish-yellow in color. Fruit and flora have a seasonal cycle that runs from October to December. The following classifications apply to *Sida cordifolia* plants according to[5]**:**

- Kingdom: Plantae
- Subkingdom: Tracheobionta
- Super division: Spermatophyta
- Division: Magnoliophyta
- Class: Magnoliopsida
- Subclass: Dilleniidae
- Superorder: Malvanae
- Order: Malvales
- Family: Malvaceae
- Subfamily: Malvoideae
- Tribe: Malvaceae
- Genus: Sida L.

- Species: *Sida cordifolia* L.

VERNACULAR NAMES

- Hindi - Kungyi
- English - Country mallow
- Sanskrit - Bala
- Tamil - Mayir-manikham
- Bengali - Brela
- Gujarati - Junglimethi
- Malayalam - Velluram
- Punjab - Simak
- Maharashtra – Chikana **(sida cordifolia)**

GEOGRAPHICAL DISTRIBUTION

It is found throughout the tropical and subtropical regions of India up to an elevation of 1800 m in Himachal Pradesh, Bengal, Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh, Assam, Jammu and Kashmir, Tamil Nadu, Uttar Pradesh, Coromandel, Karnataka, and Kerala are the chief regions of its occurrence India and Srilanka up to an altitude of 1050 m., growing wild along the roadside.[6]

DESCRIPTION[6]

Plant parts	Microscopy	Macroscopy
Root	The transverse section is circular with a very wide central woody part and a thin outer bark. Cork consists of 4-6 rows of thin-walled, tangentially elongated cells, outer 1-2 rows light brown; phellogen consisting of a single row, cortex very narrow comprising 3-4 rows of comparatively large polygonal or slightly tangentially elongated thin-walled cells, containing few clustered crystals of calcium oxalate and small starch grains.	The root occurs in variable-sized pieces, 5-15 cm long with few lateral slender rootlets of smaller size, tap root branched at the tip; outer surface buff to grayish-yellow minutely striated or smooth; odorless; taste slightly bitter.
Stem	The transverse section is circular in outline with stellate trichomes on the epidermis followed by a conspicuous zone of collenchyma, parenchyma, conducting elements, and central pith. The epidermis is composed of oval to oblong, radially elongated, thin-walled cells covered by a thin cuticle. Trichomes are stellate or glandular.	Stem occurs in variable-sized pieces, cylindrical in shape, strong, dull green covered with stellate hairs, branches 2-3 mm thick, light brown or greenish grey, softly, hairy; fracture fibrous; odour no any

	Epidermis followed by 1-2 layers of chlorenchyma followed by 4-6 layers of collenchyma consisting of round to oval cells.	specific odour; taste slightly bitter.
Leaf	The transverse section of the leaf shows a very thin cuticle with stellate and glandular trichomes on the upper and lower epidermis. Stellate trichomes present on the lower epidermis possess eight or more rays while those on the upper epidermis consist of 5-6 rays. Stomata are anisocytosis, average stomatal index of the lower surface of 27.03 and 22.4 at the upper surface. The single-layered upper epidermis consists of oval to oblong cells followed by compactly arranged, rectangular elongated palisade cells, spongy parenchyma oval to round, and loosely arranged.	They are 2-3 cm long, cordate, crenate, obtuse or sub-acute, hairy on both surfaces but more on the lower surface, nerves prominent on the ventral surface, and the dorsal surface darker. Petiole hairy and shining brightly because of stellate hairs; fracture clear; odor no any specific odor; tasteless.

THIN LAYER CHROMATOGRAPHY

Chloroform-based thin layer chromatography (TLC) of a methanol extract on a precoated silica gel 60 plates (5 cm x 15 cm): Methanol (7:3) and anisaldehyde after spraying Reagent for sulfuric acid has a brown spot at Rf. 0.76, which corresponds to ecdysterone and five spots at Rf 0.93 (violet), 0.89, and 0.88. (Violet), Blue (0.83), bluish green (0.15), and purple (0.06). (Dark blue).[7]

Plant parts	Contains
Root	Asparagine, quinazoline alkaloids, sympathomimetic amines, -phenethylamine, ephedrine, choline, betaine, rutin, phytosterol, and resin acids are some of the C28 phytoecdysones present in the root. Ephedrine, S-(+)-Nbmethyltryptophan methyl ester, -sitosterol, acylsteryglycoside sitoindoside, vasicinone, vascicine, and vasicinol. 0.06% of the roots' weight is an alkaloid.[8]
Seed	Proteins, steroids, mucin, phenethylamine, ephedrine, pseudoephedrine, fatty acids, potassium nitrate, linoleic acid, malvalic acid, sterculic acid, and coronaric acid are all present in seeds. Alkaloid makes up 0.32% of the seeds.[8]
Aerial parts	Palmitic, stearic, hexacosanoic, and -sitosterol are found in aerial portions. Alkaloid content in the plant as a whole is 0.085%, whereas it is 0.31% in the aerial portions.[8]

CHEMICAL CONSTITUENTS OF *Sida cordifolia*[6]

❖ **Alkaloids in *Sida cordifolia***

1. β-phenethylamine;
2. S-(+)-Nb-methyltryptophan methyl ester;

3. Hypaphorine;
4. Vasicine;
5. Vasicinone;
6. Vasicinol;
7. 5`-hydroxymethyl-1`-(1,2,3,9-tetrahydro-pyrrolo [2, 1-b] quinazoline-1-yl)-hepta-1-one);
8. Cryptolepine.
9. Ephedrine
10. Psuedoephedrine

❖ **Flavonoid constituents of *S. cordifolia***

11. 5,7-dihydroxy-3-isoprenyl flavones;
12. 5-hydroxy-3-isoprenyl flavones;
13. 3`-(3``,7``-dimethyl-2``,6``-octadiene)-8-C-β-D-glucosyl-kaempferol 3-O-β-D-glucoside;
14. 3-′(3″,7″-dimethyl-2″,6″-octadiene)-8-C-β-D-glucosyl-kaempferol 3-O-β-D-glucosyl[1→4]-α-D-glucoside;
15. 6-(3″-methyl-2″-butene)-3′-methoxy-8-C-β-D-glucosyl-kaempferol 3-O-β-D-glucosyl [1→4]-β-D-glucoside.

❖ **Phytoecdysteroids of *S. cordifolia*:**

16. Sidasterone A;
17. Sidasterone B;
18. 20-hydroxyecdysone;
19. 20-hydroxy-(25-acetyl)-ecdysone-3-O-β-D-glucopyranoside.

❖ **Lipophilic constituents of *S. cordifolia*, two cyclopropene fatty acids**

20. Malvalic acid;
21. Sterculic acid;
22. (10E, 12Z)-9-hydroxyoctadeca-10,12-dienoic acid.

Alkaloids

In addition to the bases choline and betaine found in the water-soluble alkaloid fraction, the roots of *S. cordifolia* provided two main types of alkaloids: -phenethylamines including -phenethylamine, two carboxylated tryptamines, (S)-(+)-Nb-methyltryptophan methyl ester and hypaphorine, and three quinazoline alkaloids: vasicine While other research observed the absence of ephedrine, ephedrine was reported in *S. cordifolia* and related species. A recent

unpublished study combining LC-MS analysis on fresh samples of several *S. rhombifolia* components and commercial samples of *S. cordifolia* found no ephedrine in the materials under study (Khan, unpublished work). *S. cordifolia* roots of six months old primarily generated quinazoline alkaloids. The main constituents of two-year-old roots were carboxylated tryptamines. Though it was noted that this substance's amount of alkaloids Age causes a plant to deteriorate. A further quinazoline a compound known as 5'-hydroxymethyl-1'-(1,2,3,9- Tetrahydropyrrolo ([2, 1-b]) quinazoline-1-yl)- The aerial components were separated from hepta-1-one). *S. cordifolia* and it was said to have animal studies on painkiller and anti-inflammatory effects fashions. Indoloquinoline, a well-known compound Cryptolepine, an alkaloid was recently isolated from *S. cordifolia* produced by this plant. On the other hand, a prior study reported that *S. cordifolia* was devoid of cryptolepine.[9]

Flavonoids

Two flavones, including a C-flavonol glycoside, 5,7-dihydroxy-3-isoprenyl flavones, and 5-hydroxy-3-isoprenyl flavones 3`-(3``,7``-dimethyl-2``,6``-octadiene) 3-O-D-glucoside of -8-C-Dglucosyl-kaempferol were separated from *S. cordifolia's* aerial portions. Additional research was conducted using three flavonol C-glycosides. These are isolated from the same source; 3′-(3″,7″-dimethyl-2″,6″-octadiene) The compound 3-O-D-glucosyl-8-C-Dglucosyl-kaempferol 6-(3-methyl-2-butene)-D-glucoside-3′-Kaempferol methoxy-8-C-D-glucosyl 3-O-Dglucosyl Furthermore, —D- glucoside compared to the formerly identified compound 1.[1]

Phytoecdysteroids

S. cordifolia seeds did not contain any phytoecdysteroids, in contrast to those of other Sida species. However, according to a different piece of research, *S. cordifolia* contains ecdysteroids. Sidasterone A and sidasterone B were extracted from this plant. 20-hydroxyecdysone and 20-hydroxy-(25-acetyl)-ecdysone-3-O-D-glucopyranoside were found in *S. cordifolia* at values of 0.001% and 0.003%, respectively, according to a recent article on the measurement of ecdysteroids in *Sida* species using LC-UV technology. Together, it seems that the majority of *Sida* species either lack ecdysteroids entirely or only contain trace amounts of them.[1]

Fatty Acids and Steroids

Sitosterol and stigmasterol[6] epoxy and cyclopropenoid fatty acids, as well as 30.7% oil, were extracted from the seeds of *S. cordifolia* those seeds. *S. cordifolia* oil largely provided

Malvalic and sterculic acids, C14:0, C15:0, C18:0, and various fatty acids) Coronary acid, C18:1, C18:2, and C18:3. Trans Lack of unsaturated fats. The freshly picked S. 0.06% of the essential oil from *cordifolia* possesses a distinct yellow color and odour. In an article recently, bioassay-directed fractionation of A hydroxyl unsaturated fatty acid was discovered through the extraction of *S. cordifolia's* MeOH extract; (10E, 12Z) 9, 12-dihydroxyoctadecadienoic acid.[8]

PHARMACEUTICAL USES

The plant has aphrodisiac, emollient, astringent, and other medicinal properties.

- **Bark:** is regarded as cooling. It helps with issues relating to the blood, throat, urinary system, piles, phthisis, and insanity, among other things.
- **Seeds:** The seeds are thought to be aphrodisiacs.
- **Roots:** It is recognized as a diuretic, astringent, stomachic, fragrant, and cooling**.**

PHYSIOLOGICAL EFFECTS

- It has a depressant effect rather than a stimulant effect on the Central Nervous System
- It may decrease both blood pressure and heart rate
- Has a hypoglycemic (blood sugar-lowering effect)
- There is no proof to support its use as a weight loss supplement
- It increases pain tolerance
- It has an anti-inflammatory effect
- Possible antioxidant effect too.

Biological activities of *S. cordifolia*[2]

Activity	Microorganisms	Plant part
Antibacterial	*Staphylococcus aureus*, *Basillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*	Ethanol leave extract[10]
Antifungal	*Candida albicans*, *C. parapsilosis*, *C. krusei, and* *C. tropicalis*	Ethanol leave extract[11]
Antifungal	*C. guilliermondii*, *C. albicans*, *C. tropicalis*, *C. krusei, and Trichosporon inkin*	Leaf powder[12]
Hypoglycemic and	Mice	Root and aerial methanol

analgesic		extract[8]
Anthelmintic	*Pheretima Posthuma* (earthworm)	Aqueous and methanol extract[8]
Anti-protozoan	*Ascaridia galli* *Hymenolepis nana*	Root chemical isolate (vasicinone)[8]
Antiulcer	Albino rat	Aerial methanol extract, ethanol leave extract[8]
Anti-inflammatory	Male Wistar rats	Ethyl acetate and methanol extract[8]
Anticancer	Human colon cancer cells (HCT-116) Human leukemia cells (LH-60	Cryptolepine (whole plant extract isolate)[8]

PHARMACOLOGY

The Pharmacological properties of *Sida cordifolia* on the cardiovascular system, the central nervous system (CNS), inflammation, analgesia, hypoglycemia, antipyretic, anti-ulcerogenic activity, anti-HIV-1 activity, and hepatoprotection have all been extensively studied. *S. cordifolia* showed neuroprotective, anti-inflammatory, and antioxidative effects comparable to the common drug deprenyl in a recent animal investigation on rats to evaluate the effect of ethanolic extract of *S. cordifolia* root on quinolinic acid-induced neurotoxicity. Quinolinic acid is an endogenous neurotoxin that is employed in research since it has been linked to several neurological illnesses. The presence of ecdysteroids may account for some of the therapeutic qualities of *Sida* species.[13][14][15]

Antioxidant activity

All *Sida cordifolia* extracts have potent antioxidant activity, including free radical scavenging and efficient reducing power. In rat liver homogenate, lipid peroxidation was reduced and superoxide scavenging activity was only seen in the root extract. These antioxidant qualities all depended on concentration. The root extract exhibited the strongest antioxidant activity.

Indian medicinal plants *S. cordifolia*, Cynodon dactylon, and Evolvulus Alsinoides are used for the treatment of neurodegenerative diseases. It has been discovered that all three Rasayana plants have antioxidant activity when used as water infusions or ethanolic extracts. This activity was assessed using the 2,2'-azinobis-3-ethyl-benzothiazoline-6-sulfonic acid (ABTS+) radical cation decolorization as In all of the aforementioned assays, it was discovered that these plants all exhibited high antioxidant activity.[16][17]

Antidiabetic Activity

By decreasing the buildup of fat in cell tissues and lowering blood sugar, *S. cordifolia* products assist in weight loss. After two hours of administration, the mice's blood sugar levels considerably (31%) fell after receiving the methanol extract of *S. cordifolia* aerial parts at a dose of 600 mg/kg, which demonstrated the greatest hypoglycemic efficacy.

In diabetic rats, it was found that an alcoholic extract of S. cordifolia with a potency of 400 mg/kg reduced triglycerides, total cholesterol, low-density lipids, plasma urea, plasma creatinine, and lipid peroxidation while significantly increasing superoxide dismutase and catalase activity and protecting against cell membrane damage.[8][11][10][18]

Cardiovascular System

A hydroalcoholic extract of *Sida cordifolia* leaves' effects on the biochemical and antioxidant profile of serum/perfusate and heart tissue homogenate representing isoproterenol and ischemia reperfusion-induced myocardial infarction in rats was assessed in a published study. *S. cordifolia* extract demonstrated preventive properties against myocardial infarction. Superoxide dismutase (SOD) and catalase levels rising at the same time has been identified as a sign of cardioprotection. When compared to the control, pretreatment of animals with the hydroalcoholic extract of *S. cordifolia* significantly increased the levels of SOD and catalase activity. The latter result demonstrated *S. cordifolia's* capacity to promote cardioprotection. In a published study, it was also mentioned that the aqueous component of an addition, it was reported in a published study that when given to normotensive non-anesthetized rats, a hydroalcoholic extract of *S. cordifolia* leaves caused observable hypotension along with strong bradycardia. The study looked into the mechanism of action and discovered that the induction of bradycardia and hypotension may be attributed to the direct activation of endothelial vascular muscarinic receptors and subsequent release of nitrous oxide, as well as indirect cardiac muscarinic activation mediated by vagal stimulation.[10][19]

Myocardial Infarction

Cardiac attacks and permanent heart muscle necrosis are both possible consequences of coronary disorders. Therefore, the use of complementary and alternative medicine in the treatment of illnesses like myocardial infarction (MI) and other cardiac-related morbidities is gaining popularity around the world; however, numerous attempts to provide scientific evidence on the ethnopharmacology efficacy of various herbs have been abandoned. Heart tissue homogenate (HTH) containing hydroalcoholic leaf extract of *S. cordifolia* doses of 100

and 500 mg/kg significantly increased endogenous antioxidants superoxide dismutase (SOD) and catalase; this establishes its potency and protective activity in the treatment of MI in conventional medicine. Histopathological observations and biochemical results revealed the therapeutic potential of the hydroalcoholic leaf extract of *S. cordifolia*. Cardioprotection can be detected by a simultaneous rise in SOD and catalase.[8][20]

Anti-pyretic and anti-ulcerogenic activity

The antipyretic and anti-ulcerogenic effects of a methanolic extract of *S. cordifolia* aerial parts were investigated. The results demonstrated that the section considerably decreased pyrexia brought on by the TAB vaccination. The extract significantly reduced the harm that aspirin and ethanol-induced ulceration could cause. These two characteristics were comparable to those of the reference medications.[8][21]

Hepatoprotective

Hepatoprotective effects of fumaric acid extracted from *S. cordifolia* have been found. Recent research has demonstrated the hepatoprotective effects of S. cordifolia aqueous extract following partial hepatectomy. Silva looked into whether *Sida cordifolia* acts similarly to sulphonylureas in stimulating the release of insulin by pancreatic â cells. Given that insulin functions as a crucial co-mitogen, it is possible to propose that *Sida cordifolia*-induced increased insulin release may have a permissive role in the synthesis of DNA in hepatocytes and, consequently, in the process of liver regeneration.[7][22]

Nephroprotective activity

It was shown that treatment with *S. cordifolia Linn*. extracts in both ethanolic and aqueous forms exhibit nephron-protecting action when compared to gentamicin. *Sida cordifolia* may have expressed its nephron-protecting action as a result of its strong antioxidant activity. One study used an aqueous extract of *S. cordifolia* at dose levels of 200 mg/kg and 400 mg/kg concentrations against the inducing drugs gentamycin (100 mg/kg) and cisplatin (7 mg/kg). The flavonoids and phenols found in this plant, contribute to antioxidant effects and have nephron-protective activity, as the cause of its protective effect.[13][23]

Activity against Alzheimer's disease

In a recent study, the effects of the aqueous fraction and its sub-fractions, including hexanes, chloroform, and the aqueous ones, on the rotenone-induced biochemical, neurochemical, histopathological, and behavioral abnormalities in rats used as models for Parkinson's disease

were evaluated. The oxidative damage brought on by rotenone increased catalepsy and postural instability while lowering rearing behavior. Co-treatment with various concentrations of the aqueous extract (the initial aqueous extract) and the aqueous extract divided between hexanes and then chloroform significantly reduced these disease symptoms (the second aqueous extract). Additionally, co-treatment with the aqueous extracts corrected the rat's midbrain region's decrease in dopamine levels. The second aqueous extract produced the most impact. As a result, *S. cordifolia's* aqueous fractions may have therapeutic value in the treatment of Parkinson's disease. The aqueous extracts' antioxidative qualities may be a mediating factor in this action.[7]

HIV-1 Antibody Activity

The substance (10E, 12Z)-9-hydroxyoctadeca-10, 12-dienoic acid was extracted from the entire *Sida cordifolia* plant. It was observed that this hydroxyl unsaturated fatty acid was a remarkable non-antagonistic NES (nuclear export signal) inhibitor for the nuclear export of Rev. The regulatory protein Rev, also known as the Rev protein, is crucial for HIV-1 replication. The latter is engaged in the export of mRNA from the nucleus to the cytoplasm, which is in charge of producing the viral proteins required for viral replication. Several analogs of 20 were created and evaluated for their ability to suppress the nuclear export of Rev, but the original substance turned out to be the most effective, most powerful. In the past, compound 20 was considered to be a natural HIV prevention tool.[6]

Antifertility activity

In Swiss albino mice, the antifertility potential of *Sida cordifolia* aqueous extract is examined. Ovarian and uterine weight loss as a result of the medication supports its antifertility effects. The outcomes of this study's histology analysis further indicate its antifertility effects.[5]

Wounds healing properties

Rats with burn, incision, and excision wounds were demonstrated to heal more quickly and have greater strength values when treated with an ointment containing an ethanol extract of *Sida cordifolia*. The effects of the standard medicine, in this case, silver sulfadiazine, were compared with the measures indicating wound healing, including wound contraction, epithelialization period, hydroxyproline content, tensile strength, and histological features.[1][11]

Activity against Bacteria

When compared to Gram-negative bacteria such as Escherichia coli and *Pseudomonas aeruginosa*, the ethanolic leaf extract of *S. cordifolia* showed greater antibacterial activity against Gram-positive bacteria like *Staphylococcus aureus* and *Bacillus subtilis*. The inhibition range was 10–16 mm at 5 and 20 mg/ml concentrations. *B. subtilis*, *E. coli*, *P. fluorescens*, *S. aureus*, and *Xanthomonas axonopodis pv. Malvacearum* were all significantly active against *S. cordifolia's* methanol leaf and root extracts, with an inhibitory zone range of 12-18 mm at 100 g/ml.[24]

Antihelmithic Activity

Earthworm anthelmintic activity of *S. cordifolia* aqueous and ethanol extracts was assessed through a bioassay (Pheretima posthuma). Both extracts demonstrated anthelmintic qualities, according to the data, although the aqueous extract was more promising and is therefore advised for use in traditional medicine. *S. cordifolia* extracts in methanol and water has an anthelmintic action on P. posthuma. The effectiveness and applicability of *S. cordifolia* in ethnomedicine applications were confirmed by a chemical isolate from the root of the plant that had antihelmintic, antifertility, and anti-protozoan activity against *Ascaridia galli* and *Hymenolepis nana*.[8]

Adaptogenic activities

Smooth stressors are called phyto adaptogens to reduce the reactivity of the host defense system. The stress system is essentially related to how adaptogens work. The ability of stress to react to future environmental signals activating and deactivating mediators of the stress response is increased by adaptogen. SCE reduces the total WBC count rise brought on by stress, indicating adaptogenic activity.[8]

Antiulcer activity

In Wistar albino rats, an oral dose of 500 mg/kg of the aerial portion of *S. cordifolia's* methanol extract effectively inhibited the ulcerogenic effects of ethanol (95%) and aspirin. In a study, albino rats that had peptic ulcers caused by the administration of aspirin, ethanol, and aspirin plus pylorus ligation in 0.2% agar were treated with 100 mg and 200 mg/kg ethanol leaf extract of *S. cordifolia*. The results showed that the extract had antiulcer properties against the three ulcer-causing models, as it reduced acidity and gastric secretion like that of famotidine.[8]

PHARMACEUTICAL USES

The plant has aphrodisiac, emollient, astringent, and other medicinal properties,[1]

- **Bark:** is regarded as cooling. It helps with issues relating to the blood, throat, urinary system, piles, phthisis, and insanity, among other things.
- **Seeds:** The seeds are thought to be aphrodisiacs.
- **Roots:** It is recognized as a diuretic, astringent, stomachic, fragrant, and cooling**.**

SIDE EFFECTS

When used repeatedly, *Sida cordifolia* can cause ephedrine-related adverse effects like sleeplessness, nervousness, and anxiety as well as an increase in blood pressure, memory loss, and even stroke.

Ephedrine and caffeine together can be fatal. Patients who are subject to IOC drug testing, those who are on MAO inhibitors (antidepressants), those with high blood pressure, cardiovascular disease, thyroid, or prostate problems, pregnant women, or nursing moms shouldn't take this herb unless under the guidance of a skilled practitioner.[6]

Classical Ayurvedic Preparations

- Bala taila
- Satapakiksirabala
- Bala curna / swarasa
- Baladya ghrta
- Baladyarista
- Baladi kvatha.

Marketed preparation

➢ **Baladhyam Gritham**

- Yakshmani Bala swadhamstra brihati kalasi dhavani sthira.
- Nimbhaha parpatakam mustham trayamanam dhuralaba.
- Krithva kashayam peshyardham dhadya dhamalakim satim.
- Dhrksha pushkaramulastcha medha mamalakanicha.
- Gritham payascha tharsidham sarpi jawaraharam param.
- Kshaya kasa prasamanam sirah parswa rujapaham.

- **Ayurveda claims that "Bala" balances all three doshas—vata, pitta, and kapha. Vata dosha is more impacted by it.**
- Madhura Valatitikta Pittatisaranasani
- Pustikapharogavisodhani Valaviryaprada**.**

Recommended Dosage

- Bala fair trade powder: Use 1/2 to 2 g daily, diluted in milk or fruit juice. (May take place throughout the day)
- Bala/*Sida cordifolia* ethical trade Alcohol volume is 25% in a tincture with a 1:3 extraction ratio. 5-10ml daily, or as recommended by a herbalist (may be divided into 1-2 dosages per day).[3]

CONCLUSION

This review conducted a thorough assessment of the existing literature and found *Sida cordifolia* to be a very promising herb from the Malvaceae family. The herb is a great alternative in the treatment of various illnesses due to its extensive pharmacological properties. It has been observed that *Sida cordifolia* has the presence of vasicinone which is a strong bronchodilator that validates its clinical efficacy in Ayurvedic treatments for illnesses comparable to the ones addressing ephedrine. Regardless of no known toxicity, the existence of alkaloids related to cryptolepine and vasicine that haven't been fully investigated may include issues about the potential toxicity and their safety. The exomorphic traits of *Sida cordifolia* are frequently misinterpreted and are compared to species of the same genus. It has been observed that commercial specimens of *Sida cordifolia* are in reality generated from substances acquired from related species, possibly due to misunderstandings. Therefore, adequate verification is required before using the herb during scientific investigations and therapeutic uses.

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