



Potential Medicinal Plants in the *Sida* Species: A Systematic Review

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Abstract

Herbs have been used by humans for thousands of years as a source of food and medicine. Indigenous people from tropical regions have been found to use various parts of the *Sida spices* plant to treat a wide range of health issues, including rheumatic affections, azoospermia, oligospermia, and spermatorrhea, leucorrhoea, wounds, sciatica, nervous and heart diseases, colds, cough, asthma, tuberculosis, and respiratory diseases, diseases of the blood, and bil Alkaloids, saponins, saponin derivatives, coumarins, steroids, tannins, phenolic compounds, cardiac glycosides, sesquiterpene, and flavonoids, all of which are present in significant amounts in the plant extract, are thought to be responsible for the plant's wide range of properties and applications in traditional medicine. The objective of this review research is to provide a thorough evaluation of the literature on the ethnomedicinal applications, phytochemical and pharmacological profiles, and toxicity of *Sida spices*.

Introduction

Since the beginning of human civilization, people have used medicinal plants for their nutritional and therapeutic benefits. Over thousands of years, people have used natural sources to create medicinal compounds, and an incredible number of contemporary pharmaceuticals have been traced back to these origins. The conventional medical usage of these medications led to the creation of several of these isolations. *Sida spices* Bunn.f (Malvaceae) is a plant that indigenous people actively use to cure a number of illnesses, such as diabetes and high blood pressure. This plant is a little perennial herb or small shrub that may reach a height of around 1.5 m [1]. It has erect, branching branches. The root of this tree is exceedingly rough, narrow, long, cylindrical, and has smooth, greenish bark. Its peduncles are the same length as its petioles, and its leaves are lanceolate and practically hairless. Yellow and single or in pairs, its blossoms have smooth, dark-colored seeds [2, 3]. In the Western region of the country, it is locally referred to as "sengh," and is widely distributed in cultivated fields, waste places, and roadside verges. The most common name for it is *Sida*. After the plant has established itself, it becomes very competitive, encroaching on other plants' area and threatening to take it over. Both seeds and stem cuttings work well for this plant's propagation.

Folklore uses

This tree's leaves, bark, root, seeds, and flower, together with its other parts, are used to cure a

variety of illnesses.

Traditional uses

All parts of the plant are utilised for medical purposes, although patients most often ask for the leaves. Plant leaves are used to treat rheumatic disorders because they are thought to contain demulcent, diuretic, anthelmintic, and wound-healing properties [4,5]. The leaves' decoction is used to cure several illnesses, including azoospennia, oligospennia, azoospennia, and stomach pain [6,] among others. The leaf's juice is also used to cure stomach ailments and vomiting in India [7, 8]. They are helpful in the treatment of tuberculosis and other diseases linked to injury, including heart disease, cough, and respiratory diseases, among other things. The roots of the *Sida* species are regarded as excellent adaptogenic and immunomodulators, as well as a general nutritive tonic and life-prolonging agent. Furthermore, root has been reported to have aphrodisiac, antirheumatic, stomachic, diaphoretic, diuretic, antipyretic, and other properties [8]. Leucorrhoea [9], respiratory problems, and cough [10] are only a few of the ailments that are treated with root extract. The fresh root is eaten in Papua New Guinea to alleviate diarrhoea, however it is also used for other things [11]. Due to its stomachic, diaphoretic, and antipyretic effects, it is often utilised in traditional Indian medicine. Its hot water extract has been used as a febrifuge, diuretic, and abortifacient, and it has historically been utilised to treat mental and urinary issues as well as disorders of the blood, bile, and liver [12]. In addition, it is used to treat ulcers, gonorrhoea, elephantiasis, and is said to have aphrodisiac properties. Root juice is used directly to burns and wounds. While this has not been established, the full plant extract is usually believed to be useful in the treatment of illnesses including fever, headache, skin conditions, diarrhoea, and dysentery [14]. In addition to being used as a demulcent to treat gonorrhoea and chronic diarrhoea, it is also utilised as a diuretic in the treatment of rheumatic diseases. It is a siddha formulation ingredient that is recommended for the treatment of gonorrhoea, spennatorrhoea, leucorrhoea, facial paralysis, tuberculosis, sciatica, haemorrhage, and rheumatism in women. A infusion of the whole plant is used in Nicaragua to cure asthma, fever, aches and pains, ulcers, and as an anti-worm medication [16, 17]. The herb has been proven to have abortifacient, anthelmintic, and antiemetic properties [15]. In contrast, sexual illnesses are treated orally using a decoction of the dried plant's complete plant. The plant is used by Central Americans to treat a wide range of conditions, including asthma, kidney inflammation, colds, fever, headaches, ulcers, and worms. The whole plant has been used to treat snake bites all across Colombia, and studies have demonstrated that it lessens the hemorrhagic effects of *Bothrops atrox* venom [19, 20]. The whole plant is said to have anti-inflammatory, anti-rheumatic, diaphoretic and febrifuge, sedative, anti-ulcer, and anthelmintic properties by the people of Cameroon. A decoction of the whole plant is used to cure fever and rheumatism, while an infusion of the entire plant is used to get rid of intestinal worms. [21] Malaria, a parasite condition, is also treated using the same decoction. The leaves may ease headaches when used as a poultice on the head. Chewing on the tooth's root may provide pain relief. Using a decoction prepared from the plant's leaves, wounds may be cleansed. Because of its capacity to produce abortions, the plant extract is sometimes referred to as an abortifacient.

Reported phytoconstituents and nutrients

Many scientific investigations have been conducted to ascertain the chemical composition of *Sida spices*. Almost every part of the plant is being studied in these research, but the leaves and roots

have received the most attention. The *Sida spices* species was phytochemically screened, and the results showed the presence of alkaloids including vasicine, ephedrine, and cryptolepine (the main alkaloid in the plant) [22,23], saponosides, coumarins, steroids including ecdysterone, -sistosterol, stig1naterol, ampesterol, tannins, and phenolic compounds including evofoli (non- chloroquine-resistant strain). The findings revealed that both strains were chloroquine-resistant (chloroquine-sensitive strain). The ethanolic extract demonstrated stronger antiplasmodial activity than the decoction [38], suggesting that it was more effective than the decoction. *Sida spices* and many other plants demonstrated great activity against malaria parasites both in vitro and when experimentally infected mice were used as test animals, according to studies on medicinal plants used to treat malaria in Nigeria [39]. *Sida spices* has high antiplasmodial effect, as shown by all of the studies.

Anti-ulcer: Akilandeswari and colleagues found that Pylorus ligation, aspirin (300 mg/kg), and ethanol (1ml/kg) injection caused stomach ulcers in experimental rats, which led to the animals' deaths [41]. The effects of the extract were then assessed after giving the mice an ethanolic extract of *Sida spices* leaves. To assess the antiulcer activity of the different medications, the ulcer indices in the test medication groups were defined and contrasted with those in the control group and with those of Famotidine 20mg/kg (used as reference drug). By lowering the ulcer index in each of the three ulcer-inducing experimental models, a significant antiulcer activity was shown, outperforming the famotidine group, at 200 mg/kg of the extract against the aspirin (300 mg/kg) plus pylorus ligation model, and at 200 mg/kg of the extract against the aspirin plus pylorus ligation model, respectively. An ethanol extract of the complete *Sida spices* plant was discovered to have antiulcer action, according to Malairajan et al. [41], who also came to the conclusion that it was successful. This plant extract's antiulcer efficacy in treating stomach ulcers brought on by aspirin with pylorus closure, HCl-ethanol-generated ulcer, and water immersion stress was examined using rats as test animals. In the first two models examined, they found that the ethanol extract considerably decreased the prevalence of ulcers. While the exact mechanisms behind *Sida spices*'s antiulcer efficacy have not been analysed, it is probable that the flavonoid chemicals, tannins, steroids, and triterpenoids contained in the plant are to blame. In numerous experimental models of gastric and duodenal ulceration, flavonoids have been demonstrated to have significant antiulcer activity [28].

Wound Healing activity:

Akilandeswari and colleagues examined the effects of topical administration of methanol extract of *Sida cutis* ointment on two types of wound models in rats, and they discovered that it was effective in both situations [40]. They discovered that they worked in both situations. It was found that in the excision model, the extract-treated wounds epithelized more rapidly and contracted at a faster pace than the control wounds. It was discovered that treatment with *Sida spices* ointment and with the reference standard Nitrofurazone ointment significantly increased the tensile strength of the 10-day-old wound when compared to the corresponding control when the results of the incision wound studies were compared with the corresponding controls. We deduced that the methanol extract of *S. cerevisiae* has the capacity to contract wounds. In each of the wound types investigated, eduleonoides ointment had a statistically significantly greater response than the control. 36 plant species used in conventional wound healing medicines were discovered by Adetutu and colleagues

[42]. *Sida spices* is one of the many plant extracts that have been demonstrated to have both antioxidant and antibacterial activities, suggesting that all plant extracts have some promise for healing wounds. The findings of this study lend credence to the traditional usage of herbs for wound healing.

Hepatoprotective activity: The hepatoprotective effects of a methanol extract of *Sida spices* against liver damage caused by paracetamol overdose were demonstrated by decreased serum levels of glutamate pyruvate transaminase, glutamate oxaloacetate transaminase, alkaline phosphatase, and bilirubin in the *Sida spices* treated groups when compared to the intoxicated controls [43]. Further proof of the drug's hepatoprotective action was supplied by the histology of the liver. When mice were given *Sida spices* extract, the severity of acute hexobarbitone-induced narcosis in the mice was significantly decreased, demonstrating the plant's hepatoprotective potential. *Sida spices* has exhibited a significant hepatoprotective effect due to the presence of ferulic acid, a phenolic component present in the root.

Cardiovascular activity: Kannan and colleagues looked at the cardioactive qualities of plants from the Indian Western Ghats. In Zebrafish embryos, [44] examined the connection between heart beat rate (HBR) and blood flow throughout the phases of diastole and systole.

Sida spices leaf extracts were evaluated for antibacterial and antifungal activity, and the findings were positive [40]. When given to Zebrafish embryos, the methanol extract of *Sida spices* produced a decline in the HBR that was greater than the decrease caused by Nebivolol (used as a reference medication). Two processes were required to extract the active ingredients from the powdered leaves using two common solvents (95 percent each of chloroform and ethanol). Each step took longer than the one before it. In this study, two Gram +ve (*Staphylococcus aureus* NCIM 2079 and *Bacillus subtilis* NCIM 2063) and two Gram-ve (*Escherichia coli* NCIM 2065 and *Pseudomonas aeruginosa* NCIM 2036) bacteria and fungi (*Candida albicans* NCIM 3102 and *Aspergillus niger* NCIM 1054) bacteria and two Gram-ve (*Escherichia coli*) Using the agar well diffusion method, the minimum inhibitory concentration (MIC) of the extracts was established, and the mortality rate of each extract was assessed at intervals ranging from 0 to 90 minutes. The researchers found that ethanol extracts had the greatest antibacterial activity (86 percent), followed by hot water extracts (61 percent), and cold water extracts (40 percent), using the agar well diffusion technique (48 percent). According to the results of tests on mortality rates, the test organisms were killed by ethanol and hot water extracts in 0–10 minutes, and by cold water extracts in 5–60 minutes, depending on the extract. The overall results were consistent with earlier studies and revealed that *Sida spices* extracts had considerable antibacterial activity against *Staphylococcus aureus* isolates from HIV/AIDS patients. The results of these studies also support the traditional use of *Sida spices* for treating common ailments and suggest its potential use in the management of *Staphylococcus aureus* opportunistic infections that affect HIV/AIDS patients.

Neuropharmacological effects: In an experiment conducted by Dora et al., an ethanol extract from the leaves and stems of *Sida spices* significantly affected the central nervous system. The average mortality showed that the extracts could kill a significant amount of the target pests. The bioassay revealed that the poisonous effect of the extracts was proportionate to the concentration used and that the observed overall mean mortality increased with an increase in the time intervals between treatments [48].

Antioxidant activity: To test *Sida spices*'s antioxidative capacity, 24 adult wistar

albino rats were divided into four groups of six rats each [25]. *Sida spices* has substantial antioxidant activity, according to the findings. Group 1 received just feed and water; groups 2, 3, and 4 also received ethanol leaf extract of *Sida spices* at doses of 20, 40, and 60 mg/kg body weight, respectively. The rats underwent treatment for one day before being killed, and their plasma was taken to be used in a test for signs of oxidative stress. Findings showed, at 40 and 60 mg/kg body weight, respectively, a statistically significant decrease ($P < 0.05$) in mean values of plasma malondialdehyde concentration and a statistically significant increase ($P < 0.05$) in reduced glutathione concentration as compared to the control group. Only the rats given 60 mg/kg body weight exhibited significantly greater plasma catalase and superoxide dismutase activity when compared to the control group ($P < 0.05$). An ethanol leaf extract of *Sida spices*, which was discovered to have antioxidant properties in a dose-dependent manner, was used to treat acute oxidative stress in rats.

Antipyretic activity: The antipyretic effect of *Sida spices* leaf extracts was investigated using petroleum ether, acetone, ethanol, and aqueous extracts of the plant. All of the extracts were shown to lower the body temperature over time, although the acetone extract had the most antipyretic effects of all the extracts. It was found that the ethanol extract had more antipyretic activity than other extracts and that its effects were more noticeable within 1.5 hours than those of other extracts. Researchers used an ethanolic extract of the entire *Sida acuti* plant and found that it had a mildly neutralising effect on the hemorrhagic effect brought on by the venom of *Bothrops atrox* [49].

Hypoglycemic activity: Using glucose-loaded rabbits, researchers examined the effects of the aqueous and methanol extracts of *Sida spices* on blood glucose levels in both normal and diabetic rabbits [51]. In diabetic rabbits brought on by alloxan, the extracts' anti-diabetic effects were also studied. The findings showed that both extracts, at 400 mg/kg, significantly increased the normal rabbits' tolerance to glucose as compared to the control group. After the glucose load, blood glucose levels were significantly lower ($p < 0.05$) than previously after 5.5 hours. This drop persisted for 10.5 hours and was consistent throughout the day. Because of this, *Sida spices*'s crude leaf extracts have hypoglycemic properties (lower blood sugar levels). **Anticancer activity:** Mallikarjuna et al. [52] conducted research to ascertain the anticancer potential of *Sida spices*'s ethanol extracts against NDEA and CC14-induced hepatocellular carcinoma in wistar rats. The extracts were discovered to have anticancer properties. The results showed significant reductions in elevated serum levels of SGOT, SGPT, ALP, LDH, and GGT as well as a significant increase in protein synthesis in a dose-dependent manner after the administration of ethanol extracts of this plant at dose levels of 200 and 400 mg/Kg body weight for 28 days.

Analgesic and anti-inflammatory activity: Studies on the analgesic and anti-inflammatory effects of *Sida scuta* were conducted using the tail immersion and mouse ear-oedema models in mice and rats, respectively [53]. In addition, the extracts showed a significant rise in the activities of antioxidant enzymes that reduce oxidative stress-induced damage. In mice, the analgesic and anti-inflammatory effects of the plant's crude extract were shown to be statistically significant ($p < 0.001$). Using petroleum ether, acetone, distilled water, and aqueous plant extracts, Mridha et al. examined the analgesic effectiveness of *Sida spices* leaf extra. As compared to the other extracts, the leaf's acetone extract showed the greatest analgesic effectiveness. This supports the traditional use of

Sida spices for the treatment of pain and inflammation [55].

Conclusion:

Sida spices has been used for a very long time in traditional medicine in many different countries throughout the globe, including the United States, to treat a wide range of bodily diseases. To cure their patients, traditional healers use the whole plant, including the leaves, bark, root, seeds, and flower. The plant was evaluated for antioxidant, antimicrobial, and antibacterial characteristics as well as cardiovascular effects, analgesic and antipyretic capabilities, hepatoprotective, hypoglycemic, insecticidal, and anticancer activities. All of the findings were positive and showed no adverse side effects. The diverse properties and historical medical uses of the plant are due to the presence of bioactive components like alkaloids, saponins, coumarins, steroids, tannins, phenolic compounds, cardiac glycosides, sesquiterpenes, and flavonoids in significant amounts in the plant extract. The plant's high mineral and vitamin content also supports its high nutritional value. The writers of this review on *Sida spices* intended for the information provided to be used as a data base for accurate assessment of this plant extract and for medicinal applications of its bioactive components.

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