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A POTENTIAL ROLE OF *STEREOSPERMUM SUAVEOLENS* DC FOR MULTIPLE DISEASES: A BRIEF ANALYSIS

Swati Lade [1], Shashi Alok [2], Sanjay Nagdev [*3], Pradeep Golani [3], Ankur Agrawal [4] and Sourabh Kosey [5]

Smt. Kishoritai Bhoyar College of Pharmacy [1], Kamptee-Nagpur - 441002, Maharashtra, India.
Institute of Pharmacy [2], Bundelkhand University, Jhansi - 284127, Uttar Pradesh, India.
Department of Pharmacy [3], Gyan Ganga Institute of Technology and Sciences, Jabalpur - 482003, Madhya Pradesh, India.
School of Pharmacy [4], ITM University, Gwalior - 475001 Madhya Pradesh, India.
Department of Pharmacy [5], Practice, NIMS University, Jaipur - 303121, Rajasthan, India.

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Correspondence to Author:
Mr. Sanjay Nagdev

Associate professor,
Department of Pharmacy,
Gyan Ganga Institute of Technology and Sciences, Jabalpur - 482003,
Madhya Pradesh, India.

E-mail: snsanjurocks@gmail.com

ABSTRACT: As a source of medicine, plants have always been exceptional. Ayurveda and other Indian texts discuss the use of plants to treat a variety of human illnesses, including cancer and diabetes. Thousands of plant species in India, which number in the tens of thousands, are thought to have medicinal use. Recent studies on plants described in historical writings or used to treat sickness have been carried out. An Indian medicinal plant of the Bignoniaceae family is *Stereospermum suaveolens DC*. It has traditionally been used as an analgesic, liver stimulant, astringent, wound healer, and antiseptic. Dashamularishta has the roots of this plant as one of its components. More research into the plant's medicinal properties has been done than the isolation of its active components. Stereospermum suaveolens have been used to treat fevers and brain disorders for their antibacterial, antiprotozoal, and anti-inflammatory properties. An in-depth look at the chemistry and pharmacology of *Stereospermum suaveolens* is presented in this paper.

INTRODUCTION: Herbs and plants have been used to treat a wide range of ailments since civilisation [1]. People in rural areas, in particular, have relied on indigenous plants for treatment for centuries. Since herbal medicines have been used for centuries in traditional medicine, the World Health Organization (WHO) is now actively promoting their usage [2].

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A species of *Stereospermum suaveolens* (*ST-SU*) DC. A huge deciduous tree with greyish or dark brown bark; family: Bignoniaceae [3]. About 100 genera and 800 species of Bignoniaceae are known for their antibacterial, antiprotozoal and analgesic activities [4]. Lapachol, a contact dermatitis elicitor, was identified in the timber and the root heartwood of *ST-SU*.

Traditional healers and rural populations employ the barks, blossoms, roots and leaves of *ST-SU* for the treatment of ailments such as vomiting, piles, acidity, diarrhoea, gonorrhoea, loss of taste, malaria, and other fevers [5]. The sub-Himalayan tract and outer hills, central India, the western peninsula, Burma, Bangladesh and the English

Forest are all hotspots for the ST-SU. Second, it is well-known for its antipyretic properties and ability to alleviate excessive thirst, coughing, and asthma symptoms. The plant consists of Imparipinate leaves with elliptic leaflets. Flowers in big, lax panicles are purplish-yellow and fragrant; capsules are straight, cylindric, greyish and speckled with white. In India, Bangladeshi and Myanmar native's Ste is a medicinal tree [6].

ST-SU timber and root heartwood both contain lapachol, a contact dermatitis elicitor. Traditional healers and rural communities employ the barks, flowers, roots, and leaves of *ST-SU* to treat various ailments [7]. Sub-himalayan and outer-hill *ST-SU* distribution, central India, western peninsula, Burma, Bangladesh, and the English Forest. It's well-known for its antipyretic properties but can also help with dry cough, asthma, and excessive thirst [8]. Several phytoconstituents present in the plant, such as lapachol, dinatin, etc., show a beneficial role in the treatment of various diseases. In *ST-SU* exploitation, the stem is stripped, the roots are cut, and the branches are broken to harvest the leaves and flowers. As a result of the invasive pathogens and physiological pressures caused by the present destructive harvesting practices, this medicinal tree species is losing its natural populations at an alarming rate [9]. This tree species may go extinct if current harvesting practices continue. *ST-SU* fruit capsules normally open on the tree, allowing the light-winged seeds to fly away in the breeze. In addition, farmers are put off by the risky and demanding task of collecting seeds by scaling the trees. Seed propagation is also time-consuming and difficult, making it more expensive [10].

As part of the famous dasamula (ten roots), it is employed in many important ayurvedic compositions. The bitter, astringent, cooling, diuretic, and tonic properties of patala are well-known. Among its many benefits are the relief of the "three dosas": anorexia, respiratory difficulties, anasarca (oedema), piles, vomiting, hiccoughs, and excessive drinking. Further research into the literature indicated that the species chosen as a source of patala was controversial. Among the three types of patala *Saligrama nighantu* identifies are the bhumipatala, the ksudrapatala, and the vallipatala Bhavaprakasa. The plant source for patala is *ST-SU*, which most authors accept without distinction. It was therefore thought that thorough research of these plants would help identify the plant as well as provide information on the plant's therapeutic efficiency [11].

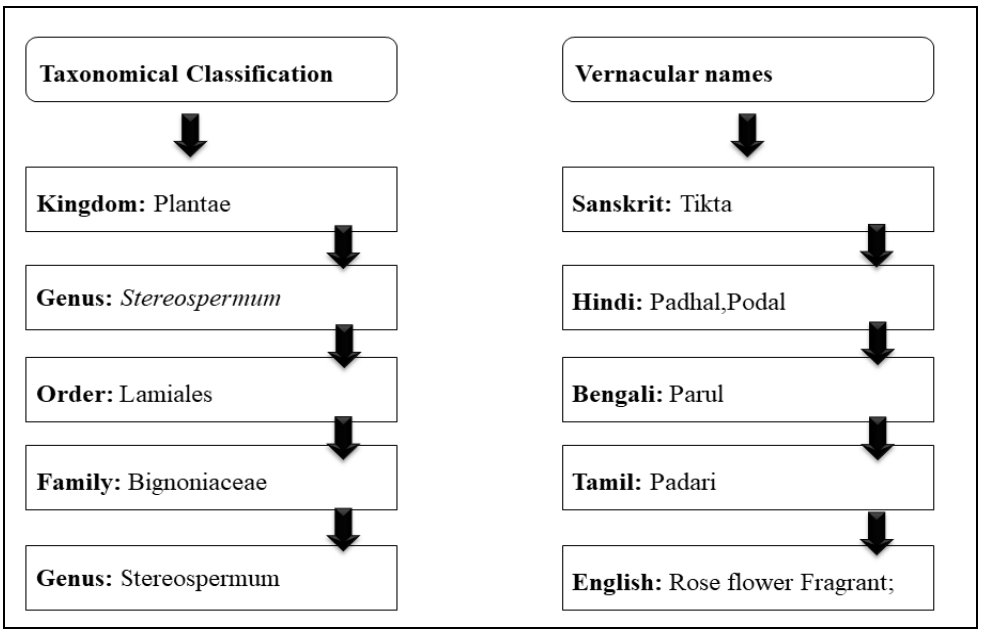

FIG. 1: SCHEMATIC ILLUSTRATION OF TAXONOMICAL CLASSIFICATION AND VERNACULAR NAMES OF *ST-SU* PLANT

1. Traditional uses of *ST-SU:* A variety of illnesses were traditionally treated with the stem and leaves of ST-SU. Root and stem are commonly used for herpes, bone pain, wound healing, and diabetes. The indigenous people of India have used it for centuries to combat snakebites, scorpion

stings and diabetes. Traditionally, the root paste has been applied topically to relieve joint discomfort. All three parts of ST-SU have been studied regarding their phytochemical content and pharmacological properties [12].

2. Chemical Constitutes of *ST-SU:* The therapeutic properties of plants are due to the presence of phytochemicals. Anti-inflammatory, antibacterial, analgesic, diuretic, anti-oxidant and antifungal effects can be found in them [13]. Pure chemicals or extracts from medicinal plants can be used to develop novel medications because of their remarkable chemical variety and because they are less expensive than their chemical counterparts. For quality control examination of a plant's chemical components, knowledge of the plant's chemical components is needed [14]. An individual chemical or a collection of compounds found naturally in the plant acts as "marker(s)". As a result of this information, the regulated market's standards will be raised through the production of specifications for the sold extracts/formulations [15]. The chief chemical constituent present in the plant is highlighted in **Table 1.**

TABLE 1: REPORTED EVIDENCE OF SEVERAL CHEMICAL CONSTITUENTS OF *ST-SU* FROM THE WHOLE PLANT

Plant part	Chemical constituents	References
Root & Root bark	β-sitosterol, n-triacontanol, p-coumaric acid, Cycloolivil	18, 19
Leaves	Flavones, stereolensin, glycoside 6-o- glucosylscutellarein, dinatin-7-glucuronides	4
Stem Bark	Fridelin, β-sitosterone, stigmasterol, 3,4-dimethoxy-ciscaffeic acid, 3-β-friedelanol, β-amyrone, glyceryl tricaprate	5, 17

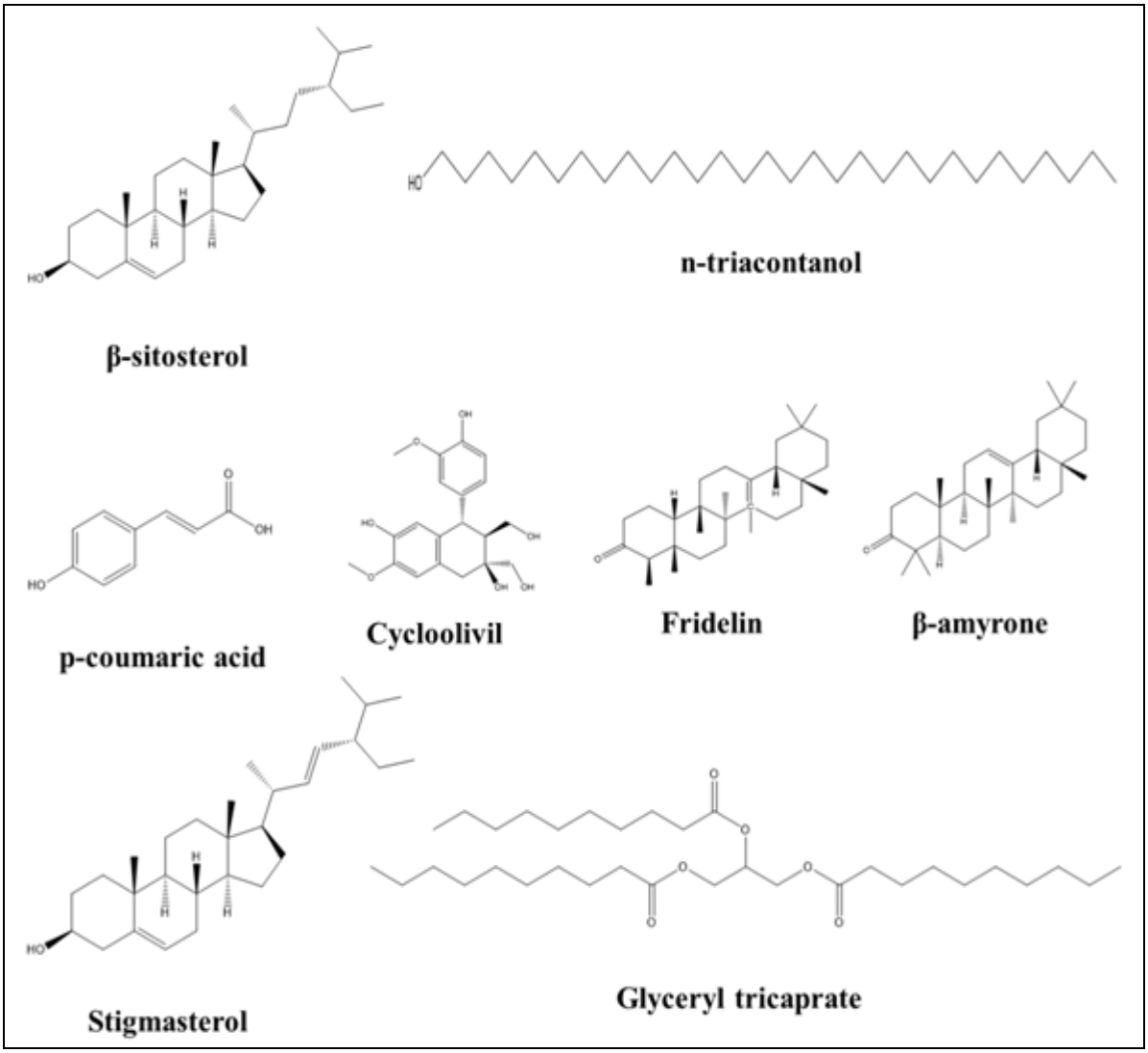

FIG. 2: CHEMICAL CONSTITUENTS OF *ST-SU*

3. Pharmacological Activities:

3.1 Analgesic & Antipyretic Activity: Balasubramanian T *et al.,* investigated the *ST-SU* analgesic activity of bark using ethanolic extract. The analgesic and antipyretic effects of oral dosages of 200 and 400 mg/kg of body weight were tested in a variety of experimental animal models. Experiments on mice show that both central and peripheral pathways are involved in relieving the pain response based on the dose-dependent analgesic effect seen in the tail-flick, hot plate, and tail clip (central) tests. Indomethacin, aspirin, and morphine were the analgesics of choice in this investigation. As an antipyretic, paracetamol was shown to have a dose-dependent antipyretic effect on rats induced with pyrexia by Brewer's yeast, and the findings were equivalent. In multiple animal models, these results showed that *ST-SU* had significant analgesic and antipyretic effects that changed with the dose [16].

3.2 Anti-inflammatory Activity: Balasubramanian T *et. al.,* demonstrated anti-inflammatory responses to*ST-SU* ethanolic extract via oral doses of 200 and 400 mg/kg body weight, and various animal models were taken to rectify the anti-inflammatory response of *ST-SU*. The typical dose of indomethacin was 10 mg/kg body weight. At the end of three hours, the extract (400 mg/kg body weight per os) inhibited rat paw edoema produced by carrageenan, dextran, and histamine at maximal levels of 64.6, 53.48, and 50.06 percent. *Stereospermum suaveolen's* ethanol extract has highest anti-inflammatory effect, dose-dependently, in numerous experimental models, were assayed according to the findings [17].

Chanshetti R *et al.* conducted an experiment on animals to rectify the anti-inflammatory and antiarthritic action of *ST-SU*. The study was performed at an average dose of 125mg/kg, 250mg/kg, and 500mg/kg (p.o.) dosages. To determine the total flavonoid content, an ethyl acetate fraction of the methanolic extract of the leaves of *ST-SU* was analysed using UV spectroscopy and TLC. To test *ST-SU* leaves ability to reduce inflammation and alleviate the symptoms of arthritis, the researchers employed carrageenan-induced rat paw edoema, and Freund's complete adjuvant-caused chronic arthritis in wistar rats. Anti-inflammatory efficacy was tested on rat paw volumes and the percentage reduction of paw edoema. Haematological and radiographic evaluations were used to determine the presence of arthritis in rats. In the methanolic extract of *ST-SU* leaves, the total flavonoids and saponins were found in the ethyl acetate fraction. Paw volume and edoema were significantly reduced ($p < .01$) at oral doses of 250mg/kg and 500mg/kg. The *ST-SU* leaves contain high levels of flavonoid concentration, and these results provide an excellent supply of these bioactive phytocomponents. Methanolic extract of *ST-SU* leaves exhibited a considerable reduction of inflammatory reaction compared to conventional medicine indomethacin. The *ST-SU* leaves demonstrated possible therapeutic usefulness in inflammation and arthritis patients [18].

3.3 Anti-filarial Activity: Vijay Lakshmi *et al.,* performed *in-vitro* and *in-vivo* evaluation of *ST-SU* for anti-filarial responses from the ethanolic extract. Experiments were conducted in vitro on adult worms and microfilariae (mf) of B. Malayi, and the effective samples were subsequently examined *in-vivo* in B. Malayi (intraperitoneally) and Mastomyscoucha subcutaneously infected with infective larvae (i.p. transplanted into the jird model *Merionesun guiculatus*). The study reveals encouraging in vitro and in vivo anti-filarial action that would be further investigated to show that the activity by assessing its biologically active fractions and phytochemical constituents [19].

3.4 Antihyperglycemic and Antioxidant Activity: Balasubramanian T *et. al.;* evaluated the antidiabetic activity *via* ethanolic extract of *ST-SU*. STZ-induced diabetic rats at doses of 200 and 400 mg/kg of body weight, given orally, were found to have antioxidant effects. Fasting blood glucose levels were reduced significantly by the ethanol extract when compared to oral Glibenclamide (0.5 mg/kg body weight). When rats were given an ethanol extract, their serum showed lower levels of glutamate pyruvate and oxaloacetate transaminases, alkaline phosphatase, bilirubin, creatinine, and urea as higher levels of total cholesterol and triglycerides, but total proteins were higher. *ST-SU* reduced the levels of thiobarbituric acid reactive chemicals and raised the functions of superoxide dismutase, catalase, glycogen, reduced glutathione, and thiobarbituric acid reactive substances in a

dose-dependent manner compared to STZ diabetic controls (P <.001). The ethanol extract of *ST-SU* demonstrates substantial antihyperglycemic and antioxidant activities [20]. Whereas Balasubramanian T *et. al.,* used ethanol extract of *ST-SU,* to rectify the antihyperglycemic potential. After a single oral dosage of 200 mg/kg of *ST-SU* ethanol extract, blood glucose levels in STZ-induced diabetic rats were investigated. The ethyl acetate fraction was administered to diabetic rats induced with STZ at a dose of 200 mg/kg once daily for 14 days. Monitored variables included fasting blood sugar, hepatic glycogen content, and pancreatic antioxidant levels. In the acute investigation, the ethyl acetate fraction significantly lowered diabetes-induced STZ rat fasting blood glucose levels. Glutathione levels decreased after 14 days of repeated oral treatment of the ethyl acetate fraction, which dramatically lowered fasting hyperglycemia and the pancreas TBARS level and increased hepatic glycogen. Histopathological examinations have reduced the STZ-induced pancreas histological damage during the subacute treatment. The results of this paper led us to the conclusion that the ethanol extract of *ST-SU* has strong antihyperglycemic and antioxidant properties, which backs up the traditional use of this plant as medicine [21].

3.5 Anti-obesity Activity: Kaveripakam *et al*., investigated the anti-obesity effect of *ST-SU* root ethanol extract on obese rats fed. By using the hot extraction procedure, preliminary phytochemical analyses were conducted on the root ethanol extract. Wistar rats were fed a high-fat diet for 40 days to create obesity. A high fat diet and oral dosage of extract at 200 and 400mg/kg bd wt for 40 days were used to test for anti-obesity effects. As a standard drug control, orlistat at a dose of 50mg/kg.bd.wt was employed. The effects of a high-fat diet were reversed in a dose-dependent manner in animals given extract for 40 consecutive days in conjunction with a high-fat diet. For the treatment of obesity, ST-SU root ethanol extract shows encouraging results [22].

3.6 Antiulcer & Gastroprotective Activity: Muchandi *et al*. investigated the anti-ulcer effect of *ST-SU* using methanolic extract. They discovered that therapeutically similar doses of methanolic stem bark extract reduced all ulcerogenic factors significantly. Consequently, the antiulcer effect of the extract may be linked to one or more of these physical and physiological aspects [23].

3.7 Hepatoprotective Activity: Chandrashekhar V. M. *et. al.;* evaluated the hepatoprotective activity of *ST-SU via* albino rat's model to assess the level of protection provided by this activity. These biochemical parameters were also used to assess the level of SGPT protection. There was a statistically significant ($p < 0.001$) reduction in the activity of serum enzymes and in the production of bilirubin in the methanol stem bark extract of *ST-SU* at dosages 125, 250, and 500 mg/kg, and a reference standard Liv-52 treatment group. SOD, CAT, GSH, and total thiol levels were considerably higher in the extract group than in the control group ($p < 0.001$). Several investigations in animals have shown that the extract has a protective impact on their tissues. The outcomes of the proposed investigation showed better ST-SU methanol stem bark extract results for hepatoprotective action [24].

3.8 Diuretic Activity: Balasubramanian T *et al.*, investigated the anti-diuretic efficacy of *ST-SU* using ethanolic extract at an oral dose of 200-400mg/kg and 5mg/kg furosemide used as a standard. There was a dosage-dependent diuretic activity of 1.10 and 1.04, 1.93 and 1.82 found at doses of 200 and 400mg/kg of the extract for 5 h and 24 h, respectively. The extract also had a considerable impact on electrolyte excretion. There was a substantial increase in the excretion of Na+, Cl, and Ca2+ ions in the extract at both doses ($P<0.05$ and $P<0.01$) as compared to the control. The difference in urine's pH was minuscule. According to the results of the acute toxicity trials, the *ST-SU* did not cause any deaths up to a maximum dose of 3200 mg/kg, b.w., hence it is safer to use [25].

3.9 Anti-Diabetes Activity: Balasubramanian T. *et al.,* investigated the anti-diabetes activity of *ST-SU* towards streptozotocin-induced rat model**.** STZ diabetic rats were given oral dosages of 200 and 400 mg/kg of the ethyl acetate fraction. The glucose oxidase method was used to assess blood glucose levels. The hepatoprotective activity of the ethyl acetate fraction was assessed in diabetic rats and compared to that of diabetic control rats. Ethyl acetate fraction was also assessed for its

antioxidant activity utilizing several liver markers such as TBARS, GSH, SOD and CAT. This study shows that treatment of the ethyl acetate fraction (200 and 400 mg/kg) reduced fasting blood glucose levels in diabetic rats while increasing GSH and SOD and CAT activity levels. The liver tissues of diabetic rats were found to be protected by ethyl acetate fraction in histopathological tests as well. The *ST-SU* extracts were found to alter antioxidant enzyme and nonenzymatic activity, as well as the liver's ability to resist oxidative stress in STZ-induced diabetic rats [26].

3.10 Antioxidant Activity: Chandrashekhar V. M. *et. al.,* evaluated the antioxidant activity of *ST-SU* utilising methanolic extract. The *in-vitro* free radical scavenging capacity of various quantities of methanolic extracts of plants was examined using several methods. IC_{50} values were used to measure antioxidant activity. It was discovered that at concentrations of 125 µg/ml and 62.25 ppm nitric oxide was the most effective DPPH radical scavenger; 72.54 percent of lipid peroxidation, 74.13 percent of hydroxyl radical scavenging and 79.55 percent of nitric oxide was scavenged [27].

3.11 Immunomodulatory Activity: Maji A. K. *et. al.,* determined the qualitative and quantitative estimation of *ST-SU* root extract via RP-HPLC. Standardization of plant material with an appropriate concentration of recognised active components is required. *In-vivo* models of sheep red blood cell antigenic challenge were used to investigate the immunomodulatory potential of ST-SU. Dehydro-lapachone and lapachol were identified in *ST-SU* at 0.043 ± 0.003 and 0.16 ± 0.002 % (w/w), respectively, by RP-HPLC analysis.

Rats given (100-300 mg/kg) had higher counts of white blood cells, including monocytes and neutrophils, than rats given unstandardized doses. To further enhance neutrophil adherence to nylon fibers, *ST-SU* treatment boosted the DTH response, phagocytic activity, and intracellular killing potential of phagocytes in a dose-dependent way. The researchers discovered that *ST-SU*, when administered at a dose of 300 mg/kg, significantly stimulated the immune system ($p< 0.001$) compared to the control. The *ST-SU* appears to have the potential to increase the body's own inherent defences mechanisms, suggesting that it could be used as an alternative treatment for illnesses that damage the immune system [28].

3.12 Neuroprotective Activity: Shalavadi M. H. *et al.,* performed neuroprotective activity. All rats were separated into five groups of eight, each receiving normal saline (10ml/kg) for 10 days before the experiment; the control and sham groups received 10ml/kg, while the *ST-SU* groups received methanol extract of *ST-SU* orally (125, 250 and 500 mg/kg) for that period. A 30 min BCA occlusion followed by a 4 h reperfusion time period resulted in global cerebral ischemia. The UV spectroscopic approach was used to measure the antioxidant enzymatic and non-enzymatic levels and the extent of cerebral infarction; histological tests were also performed. MES has a lethal dose half-life of 5000 mg/kg body weight. Doses of 125, 250, and 500 mg/kg of body weight were used in the study. The *ST-SU* methanol extract exhibited a neuroprotective effect. The extract's preventive effect was further validated by histological investigations that measured the extent of the infarction. Studies show that ST-SU may protect the brain from global cerebral ischemia/reperfusion [29].

Whereas, in another study, Shalavadi M. H. *et al.*, determined neuroprotective activity of *ST-SU* inducing 6-hydroxy dopamine Parkinson model. The investigation was conducted on Sprague-Dawley rats, where the striatal 6-hydroxy dopamine lesions were used to generate parkinson's disease. For 42 days, ST-SU methanolic extract was administered to the test animals in doses of 125, 250, and 500 mg/kg.

Assessment of behaviour, spontaneous locomotion and muscular coordination were all investigated. Antioxidant concentrations, the size of the striatal infarction, and histological examinations were all performed. The *ST-SU* methanolic extract increased behavioural activity and improved muscle coordination in a dose-dependent manner [30].

CONCLUSION: As a member of Bignoniaceae and found in the sub-Himalayan region and the outer hills of central India, *ST-SU* is a medium-sized deciduous tree. The western peninsula, Burma, Bangladesh, and the English Forest are all included in this category.

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CONFLICTS OF INTEREST: None

The present review highlights various pharmacological potentials of the *ST-SU* plant. To ensure that humans can benefit from this plant's uses in their daily lives, it should be extensively disseminated in the study of the world. *ST-SU* efficacy and safety against various diseases need to be studied further, as do other pharmacological actions, which could lead to the discovery of better and more effective phytoconstituents for treating various ailments. Thus, this paper will provide depth knowledge to readers working in pharmacognostic, nutraceutical, and herbal medicine.

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