



Solanum trilobatum (Solanaceae) – An Overview

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Abstract

Solanum trilobatum Linn (Family: Solanaceae) is one of the important medicinal plant, more commonly available in Southern India. *Solanum trilobatum* is an extensively used Indian traditional medicine to cure various human ailments. It was distributed throughout the southern parts of India. *S. trilobatum* is reported to cure numerous diseases viz., tuberculosis, respiratory problems and bronchial asthma. *S. trilobatum* was reported to harbour hepatoprotective activity, antimicrobial activity, antioxidant activity, cytotoxic activity, haemolytic activity, protective effect, immunomodulatory activity and anti-inflammatory properties. Phytochemical screening showed the presence of carbohydrates, saponins, phytosterols and tannins in leaf, whereas, stem possess carbohydrates, saponins, phytosterols, tannins, flavonoids and cardiac glycosides as major phytochemical groups.

Keywords: *Solanum trilobatum*, pharmacological studies, phytochemical screening.

1. Introduction

Nature has a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources, many based on their use in traditional medicine. Even now, approximately 80% of the third world population is almost entirely dependent on traditional medicines for maintaining general health and combating many diseases [1]. Herbal medicine is the foundation for about 75–80% of the World population, mainly targeting primary health care for in the developing countries because of better cultural acceptability, compatibility with human body and lesser side effects. However, there is a drastic increase in the usage of herbal medicine was found in last few years from the developed countries [2]. The World Health Organization (WHO) has also recommended the evaluation of plants for effectiveness against human diseases and for the development of safe modern drugs [3]. *Solanum trilobatum* Linn (Family: Solanaceae), a thorny creeper with bluish white flower and grows

as a climbing under shrub. It is one of the important medicinal plant, more commonly available in Southern India and has been used in herbal medicine to treat various diseases like respiratory problems, bronchial asthma and tuberculosis [4]. This plant is well known in Ayurveda and Siddha systems. In Sanskrit it is known as 'Alarka', in Telugu 'Alarkapatramu', in Tamil 'Tuduvalai' and in Malayalam 'Tutuvalam'. The roots, berries and flowers are used for cough [5].

2. Botanical Description

Solanum trilobatum Linn (Solanaceae), the nightshade, (order Solanales), with 102 genera and nearly 2,500 species. It is a prickly diffuse, bright green perennial herb, woody at the base, 2–3 m height, found throughout India, mostly in dry places as a weed along roadsides and waste lands. The plant having much branched spiny scandent shrubs. Leaves are deltoid or triangular, irregularly lobed. Flowers are purplish-blue, in cymes. Berry are globose, red or scarlet.

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3. Traditional Uses

Plants are playing an important role in the health of millions of people's life in many villages of India in their day to day life by its traditional usage. *S. trilobatum* is reported to cure numerous diseases viz., respiratory problems and bronchial asthma. *S. trilobatum* was reported to harbour hepatoprotective activity, anti-microbial activity, larvicidal activity, antidiabetic activity, cytotoxic activity and anticancer activity. The leaves and stem of *S. trilobatum* are reported to possess antimitotic, anti-inflammatory and anti-ulcerogenic properties. The leaf extracts are used to increase male fertility and to cure snake poison [6]. It is used with ghee in siddha for treating tuberculosis, as decoction in case of acute and chronic bronchitis, root and berries for treating cough [7]. The major alkaloids identified in the alcoholic extract from leaves and stem part of *S. trilobatum* has been shown to possess antimitotic and antimicrobial activity against bacteria and fungi. Biological screening of the alkaloid mixture of this plant revealed anticancer activity against certain type of cancer and its effectiveness as an adjuvant in cancer chemotherapy [8].

4. Habitat and Synonyms

Botanical name : *Solanum trilobatum* Linn.

Family : Solanaceae

4.1 Synonyms

Sanskrit : Alarka, Vallikantakaarika, Kantakaari-lata.

English : Climbing Brinjal.

Hindi : Kantakaari-lataa.

Malayalam : Padarchunda, Parachunda, Tootuvila.

Marathi : mothiringnee, thoodalam.

Tamil : Tuduvilai, Nittidam, Sandunayattan, Surai.

Telugu : Alarkapatramu, kondavuchinta, mullamu-stil.

Kannada : Kakamunji, Ambusondeballi.

Oriya : Bryhoti.

4.2 Ayurvedic Properties

Rasa : Tikta, Kashaya

Guna : Lakhu

Virya : Seeta

4.3 Distribution

Thoroughout India, growing wild.

4.4 Medicinal Properties

Plant pacifies vitiated pitta, kapha, cough, bronchitis, dyspnoea, anorexia, worm infestation, skin diseases, hemeplegia, edema, urinary calculi, amenorrhea, and urinary tract disorders.

Useful part: Whole plant [9, 10].

4.5 Phytochemical Studies

Phytochemical screening of various extracts such as chloroform, ethanol, water of *S. trilobatum* revealed the presence of secondary metabolites such as Steroids, triterpenoids, sugars, Reducing sugars, phenolic compounds, tannins, anthroquinone, amino acids, Saponins [11]. Phytochemical analysis of dried powder of *S. trilobatum* leaves showed the presence of carbohydrates, saponins, phytosterols and tannins, where as the stem portion possess carbohydrates, saponins, phytosterols, tannins, flavonoids and cardiac glycosides. Alkaloides such as soladunalinidine and tomatidine(4) were isolated from the leaf and stem of *Solanum* species. *S. trilobatum* contains chemical compounds like Sobatum(1), β -solamarine, solasodine(2), solaine(3), glycoalkaloid and diosogenin(5) [12].

5. Pharmacological Studies

5.1 Anti-microbial and Haemolytic Activity

In this study, the leaves and stem extracts of *S. trilobatum* were prepared in different polarity solvents (n-butanol, chloroform and methanol) and the dried plant extracts were used for the estimation of antimicrobial and

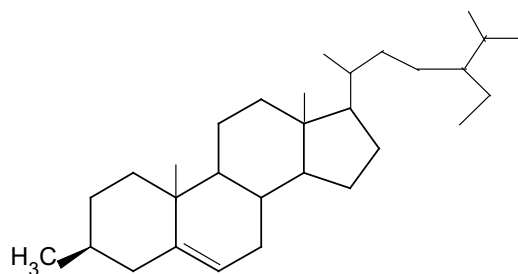


Fig. 1. Structure of Sobatum

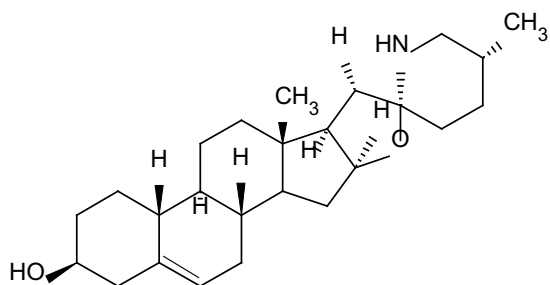


Fig. 2. Structure of Solasodine

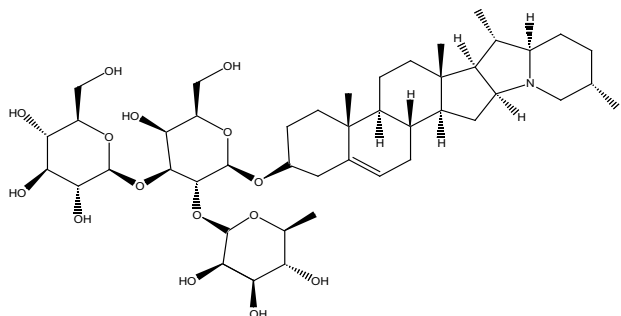


Fig. 3. Structure of Solaine

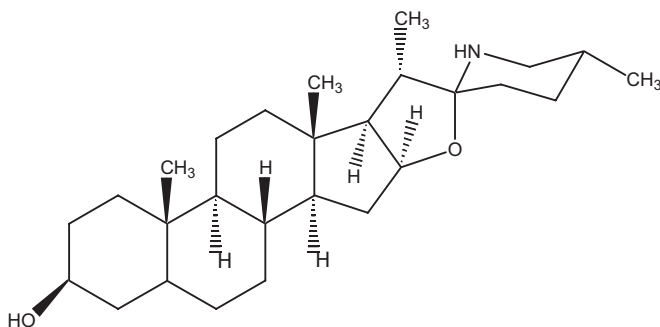


Fig. 4. Structure of Tomatidine

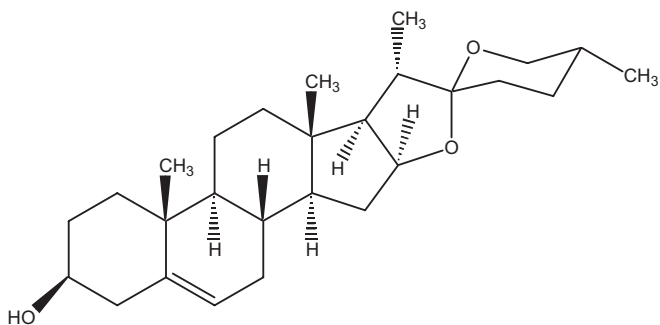


Fig. 5. Structure of Diosgenin

hemolytic activity. The n-butanol extracts of *S. trilobatum* leaves and stem showed antimicrobial activity against all test organisms. Methanol extract of *S. trilobatum* leaves and stem showed antimicrobial activity against *K. pneumonia* and *S. aureus* respectively. Whereas, chloroform extract of *S. trilobatum* leaves and stem not showed any antimicrobial activity [6].

5.2 Protective Effect

Protective effect of an aqueous leaf extract of *S. trilobatum* extract was examined against lead acetate Swiss albino mice. The oral administration of the above extract for 30 days against lead acetate affected mice significantly increased the levels of antioxidants (SOD, CAT, GPx) and decreased the level of lipid peroxidation (LPO). The results of the present study, for the first time, provide clear evidence of defence provided by *S. trilobatum* extracts against lead acetate induced toxicity in brains of albino mice [12].

5.3 Anti-inflammatory

Methanol extracts of *S. trilobatum* Leaf were investigated for anti-inflammatory activity with acute and chronic models. In the doses of 100, 200 and 300 mg/kg exhibited significant ($P < 0.05$) anti-inflammatory activity in all the models tested. The methanol extracts of *S. trilobatum* Linn at 300 mg/kg showed maximum inhibition of 54.44% in carrageenan-induced rat paw oedema while the standard drug indomethacin was 57.08% after 3 hrs of carrageenan injection. On the other hand at 100, 200 and 300 mg/kg inhibited with dextran, histamine and serotonin-induced rat paw oedema significantly and dose dependently compared with control group. In the chronic inflammatory model, at a dose of 200 and 300 mg/kg inhibited the granuloma weight by 22.65%, whereas the indomethacin inhibited 28.37% [13].

5.4 Oviposition Deterrent and Skin Repellent Activity

The leaf extract of *S. trilobatum* (Solanaceae) was tested under laboratory conditions for oviposition deterrent and skin repellent activities against the adult mosquito *Anopheles stephensi*. Concentrations of 0.01, 0.025, 0.05, 0.075 and 0.1% reduced egg laying by gravid females

from 18 to 99% compared to ethanol-treated controls. In skin repellent tests, concentrations of 0.001, 0.005, 0.01, 0.015, and 0.02% provided 70 to 120 minutes protection against mosquito bites, whereas the ethanol control provided only 2.2 minutes of protection. Both oviposition deterrent and skin repellent activity were dose dependent. The results suggest that the leaf extract of *S. trilobatum* is an effective oviposition deterrent and skin repellent against *A. stephensi* [14].

5.5 Anti-oxidant Activity

A chloroform extract of *S. trilobatum* was analysed and compared with reference antioxidants for its in-vitro antioxidative properties such as scavenging of α -diphenyl-b-picryl hydrazyl (DPPH) and superoxide radicals, protection to deoxy ribose degradation, reducing power, as well as inhibition of lipid peroxidation. When compared to the reference antioxidant butylated hydroxyl toluene (BHT), chloroform extract of *S. trilobatum* exhibited less scavenging effect of DPPH radicals and reducing power but a better superoxide radical scavenging effect. From a comparison of the hydroxyl radical scavenging effect of chloroform extract of plants with catechin, it seemed that chloroform extract was found four times effective than catechin. This was able to prevent the formation of OH⁻ induced malondialdehyde (MDA) in rat liver homogenate [15].

5.6 Anti-bacterial Activity

The antibacterial activity of aerial parts of *S. trilobatum* was assayed under in vitro conditions by agar disc diffusion and well diffusion method against four bacterial species. All the solvents, ethanol, acetone, ethyl acetate used for the extraction of leaves, flower and fruits were shown significant antibacterial activity except acetone and ethyl acetate extracts of flower against *K. pneumoniae*. Gram-positive bacteria *S. aureus* was more susceptible to inhibition when compared to the Gram-negative bacterial species tested. This is in agreement with previous reports that plant extracts are more active against Gram-positive bacteria than Gram negative bacteria. Amongst the Gram-negative bacteria *P. aeruginosa* was more susceptible to inhibition by the extracts when compared to other bacterial species tested. The inhibition of bacterial growth by *S. trilobatum*

extracts was found to be significantly higher than that of standard antibiotics tested [16].

5.7 Immunomodulatory Activity

Aqueous extract of leaves of *S. trilobatum* Linn (Solanaceae) was pharmacologically validated for its immunomodulatory properties in experimental animals. Oral administration of extract at dose of 100, 200 & 400 mg/kg significantly increased in percentage neutrophil adhesion ($P < 0.001$). The Delayed Type Hypersensitivity also showed a dose dependent activity ($P < 0.001$). Further, a dose related increase in hemagglutination antibody titer was observed with different doses as compared to control group. Carbon clearance test was conducted to establish phagocytic activity of reticuloendothelial system after treatment with aqueous extract. Phagocytic index was significantly increased after the administration of *S. trilobatum* compared to control group ($P < 0.001$). These findings suggested that the immunostimulatory activity of *S. trilobatum* influences by potentiating humoral as well as cellular immunity [17].

5.8 Antidiabetic Activity

The study was conducted to evaluate the antihyperglycemic activity of the ethanolic extracts of *S. trilobatum* (STEt) leaves on blood glucose of albino rats. Diabetic rats had much reduced body weight than normal rats. Administration of the extracts at the dose of 400 mg/kg body wt./day resulted in a marked decrease in the levels of fasting blood glucose with a concomitant increase in body weight. *S. trilobatum* extract at 400 mg/kg was found to be comparable to glibenclamide. STZ-diabetic rats treated with STEt (400 mg/kg) significantly reversed all these changes to near normal. These results suggest that STEt induce antihyperglycemic as well as antihyperlipidemic activities in STZ-diabetic rats [18].

6. Results and Discussion

The extensive survey of literature revealed that *S. trilobatum* is an important source of many pharmacologically and medicinally important chemicals, especially steroidal hormone solasodine and other chemicals like solasonine, diosgenin and various useful alkaloids. The plant is extensively studied for the various pharmacological activities like hepatoprotective, anti-inflammatory, anti-microbial

and haemolytic activity, immunomodulation, antibacterial etc. Although the results from this review are quite promising for the use of *S. trilobatum* as a multi-purpose medicinal agent, while *S. trilobatum* has been used successfully in Ayurvedic medicine for centuries, more clinical trials should be conducted to support its therapeutic use. Moreover, the therapeutic potential of the plant should also be checked when used in combination with other herbal drugs.

7. Conclusion

Natural products from folk remedies have contributed significantly in the discovery of modern drugs and can be an alternative source for the discovery of novel structures with better safety and efficacy profiles. Ethnobotanical and traditional uses of natural compounds, especially of plant origin received much attention in recent years as they are well tested for their efficacy and generally believed to be safe for human use. Thorough screening of literature available on *S. trilobatum* depicted the fact that it is a popular remedy among the various ethnic groups, Ayurvedic and traditional practitioners for treatment of various ailments.

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