Original Research Article

J. Funct. Mater. Biomol. 10 (1) (2026) pp 1161-1167

SACRED HEART RESEARCH PUBLICATIONS

Journal of Functional Materials and Biomolecules

Journal homepage: www.shcpub.edu.in

ISSN: 2456-9429

Phytochemical analysis of different solvent leaf extracts of *Solanum trilobatum* and antimicrobial activity of ethanolic leaf extract of *Solanum trilobatum*

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Received on 11 April 2026, accepted on 21 May 2026,

Published online on June 2026

Abstract

The goal of the current study was to assess the antibacterial activity and phytochemical components of several solvent extracts of *Solanum trilobatum* leaves. Using ethanol, aqueous, acetone, and chloroform solvents, fresh leaves were gathered, shade-dried, pulverised, and extracted. To find significant bioactive substances such carbohydrates, tannins, saponins, alkaloids, flavonoids, glycosides, quinones, phenols, terpenoids, and steroids, qualitative phytochemical screening was done. All solvent extracts contained carbohydrates, tannins, alkaloids, phenols, and steroids, according to the study, but aqueous and acetone extracts also contained other phytochemicals such terpenoids and flavonoids. *Escherichia coli, Klebsiella pneumoniae, Streptococcus pneumoniae, and Bacillus subtilis* were among the bacterial strains against which the ethanolic leaf extract's antibacterial efficacy was assessed using the agar well diffusion method. The ethanolic extract demonstrated notable antibacterial activity at varying doses (50, 75, and 100 µg/ml), with a maximal zone of inhibition noted at 100 µg/ml. The study's conclusions support the possible use of *Solanum trilobatum* leaves in herbal medicine and the creation of natural antimicrobial agents.

Keywords: *Solanum trilobatum*, Chloroform extract, Acetate extract, Ethanolic extract, Aqueous extract, antimicrobial activity and Phytochemicals.

1. Introduction

Naturally arising nutritional and non-nutritional elements in numerous species of edible vegetation has its contribution in pharmacological action. *Solanum trilobatum* has a typical botanical description [1]. The medicinal importance of plants was reported by many researchers. Iscador, a commercial preparation from Viscum album, produced cytotoxicity in various cell lines. Berger et al. found that certain tumours and cell lines were not found to be sensitive to Iscador therapy. It was also reported [2]. *Solanum trilobatum* (Solanaceae) is a climbing shrub of Southern India, and Siddha saints have considered it as one of the important rejuvenator drugs. The decoction of various parts of the plant is used in chronic bronchitis. Roots are used [3]. Topographic imaging of antigen-antibodies, AFM

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spectroscopy to measure intermolecular force between the drug and its enzyme [4]. *S. trilobatum* L. is an important medicinal plant. The leaves contain rich amounts of calcium, iron, phosphorus, carbohydrates, protein, fat, crude fibre and minerals. This herbal plant is used as medicine for asthma [5]. vomiting of blood and bilious matter, phlegmatic rheumatism, several kinds of leprosy. It is also antibacterial, antifungal, antimitotic and anti-tumorous [6]. Various members of this genus have been in focus for in vitro regeneration because of their high medicinal value owing to the presence of β-solanargine, solasodine and other closely related glyco-alkaloids. β-solanargine and solasodine are the major constituents in this species [7]. It is also used as a nanomedicine for antibacterial activity and human breast cancer [8]. In this plant, we can perform various tests by its extract obtained from its parts. The essential tests carried out in *Solanum trilobatum* are phytochemical screening [9]. In this plant, *sobatum i*s the compound that inhibits tumour growth. Our group has reviewed DNA methylation [10].

2. Experimental selections

2.1 Collection of plant material

The leaves of *Solanum trilobatum* were freshly collected from a well-matured plant from Aadhiur, a village in Tirupattur District, Tamil Nadu. The leaves are washed with water and dried carefully in the absence of sunlight to remove the molecule present in the leaves. The dried leaves are made into fine powder using blender. Then the fine powders are stored properly in an airtight container for future purpose.

Fig 1. *Solanum trilobatum*

2.1.1 Scientific classification

Binomial Name : *Solanum trilobatum* L.

Family : Solanaceae (Nightshade family**)**

Genus : Solanum

Species : S. trilobatum

Synonyms : Solanum procumbens Lour., Solanum acetosifolium Lam., Solanum canaranum Miq**.**

2.2 Extraction of the sample

About 5 grams of fine powder of the leaf was mixed with 50 mL of ethanol. Then the suspension is left to 24 hours for incubation; meanwhile, occasional Shaking was allowed. After 24 hours of incubation, the contents are filtered through what man No. one filter paper. Then the filtrate was collected separately and left for evaporation under using vacuum distillation and dried. The residues Ethanol, Aqueous, Acetone and chloroform extracts of

Solanum trilobatum were collected and stored in an airtight container for further analysis [11].

2.3. Qualitative Phytochemical Analysis

The plant extract was tested for detecting various Phytochemicals present in the various solvent extracts of *Solanum trilobatum* using the standard method [12,13].

1. Test for carbohydrates

A) Molish's test

Plant extract was treated with a few drops of α-naphthol, and concentrated sulphuric acid was added to the mixture in a slanting position. Observance of the violet colour ring indicates the presence of a carbohydrate.

b) Benedict's test:

0.5 ml of extract was treated with 0.5 ml of Benedict's reagent and kept in a water bath for 2 minutes.

Formation of precipitates indicates the presence of carbohydrates.

2. Test for tannins

a) Ferric chloride test

A small quantity of extract was mixed with water and heated in a water bath. The mixture was filtered, and 5% of ferric chloride was added to the filtrate. A dark green colour was formed. It indicates the presence of tannins.

b) Lead acetate test

3 ml of 10% lead acetate was added to the sample solution. Formation of bulky white precipitate indicates the presence of tannins.

3. Test for saponins

2 ml of distilled water was added to the sample solution and shaken well. Formation of foams indicates the presence of saponins.

4. Test for alkaloid

a) Mayer's test

The sample solution is treated with 2 drops of Mayer's reagent. Formation of white creamy precipitate indicates the presence of alkaloids.

b) Wagner's test

A few drops of Wagner's reagent were added to the sample. Formation of reddish-brown precipitate indicates the presence of alkaloids

5. Test for Flavonoids

The sample solution is treated with 1 mL of 2N sodium hydroxide. Formation of yellow colour indicates the presence of flavonoids.

6. Test for glycosides

The sample solution is treated with 3 ml of chloroform and 10% ammonia. Formation of pink colour indicates the presence of glycosides.

7. Test for quinones

1 ml of concentrated sulphuric acid is added to the sample in a slanting position. Formation of red colour indicates the presence of quinones.

8. Test for Phenols

The sample solution is treated with few drops of 10% ferric chloride. Formation of blue or green colour indicates the presence of phenols

9. Test for terpenoids

The sample solution is added with 2 ml of chloroform and treated with concentrated Sulphuric acid. Formation of red brown colour indicates the presence of terpenoids.

10. Test for steroids

Few drops of concentrated sulphuric acid is added to the sample solution in a slanting position. Occurrence of brown ring indicates the presence of steroids.

2.4 Antibacterial activity

Antibacterial activity was analysed with the standard agar well diffusion method. Different concentrations of the ethanolic extract (50, 75, 100 µg/mL) were prepared by using 5% DMSO (Dimethylsulphoxide). 10µL of 24h test cultures such as *Escherichia coli*, *Klebsiella pneumoniae, Streptococcus pneumoniae, Bacillus subtilis* were spreaded onto respective Muller-Hinton agar medium by spread plate method. The plates were then incubated at 37°C for 24 hours. The antibacterial activity was analyzed by measuring the diameter of zone of inhibition formed around the well [14,15].

3. Results and Discussions

3.1 Phytochemical analysis

Table 1: Phytochemical analysis of leaf extract of *Solanum trilobatum*

Using various solvent extracts of *Solanum trilobatum* leaf was studied for the analysis of phytochemical compounds. It shows the presence of carbohydrate, tannins, alkaloids, phenols, & Steroids in all various solvents. Table 1 indicates some of the phytochemical compounds of present in the various solvents [16].

S.No.	Phytochemical Compounds	*Solanum trilobatum* ethanol extract of the leaf	*Solanum trilobatum* aqueous extract of the leaf	*Solanum trilobatum* acetone extract of the leaf	*Solanum trilobatum* chloroform extract of the leaf
1.	Carbohydrate	+	+	+	+
2.	Tannins	+	+	+	+
3.	Saponins	+	+	+	-
4.	Alkaloids	+	+	+	+
5.	Flavonoids	-	+	-	-
6.	Glycosides	-	-	-	-
7.	Quinones	+	-	+	+
8.	Phenols	+	+	+	+
9.	Terpenoids	-	+	-	-
10	Steroids	+	+	+	+

The analysis of preliminary phytochemical screening using ethanolic extract of *Solanum trilobatum* leaf concludes the presence of Carbohydrates, Tannins, Saponins, Alkaloids, Quinones, Phenols & Steroids. The analysis of preliminary phytochemical screening using the ethanol extract of *Solanum trilobatum* leaf concludes the absence of Flavonoids, Glycosides & Terpenoids.

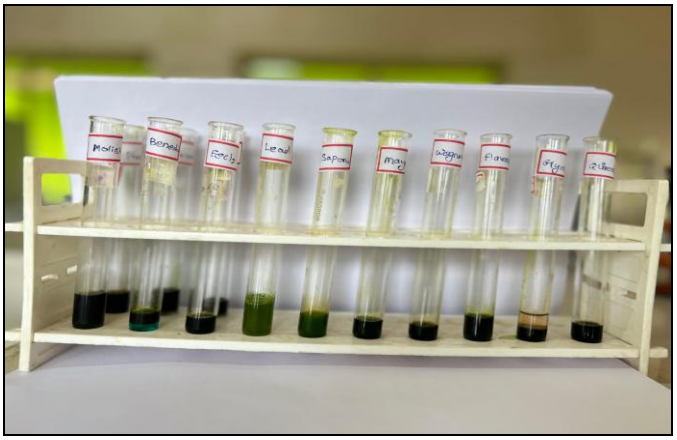

Fig. 2. Phytochemical analysis of ethanol extract of *Solanum trilobatum* leaf

The analysis of preliminary phytochemical screening using the aqueous extract of *Solanum trilobatum* leaf concludes the presence of Carbohydrates, Tannins, Saponins, Alkaloids, Flavonoids, Phenols, Terpenoids & Steroids. The analysis of preliminary phytochemical screening using Aqueous extract of *Solanum trilobatum* leaf concludes that absence of Glycosides & Quinone.

Fig. 3. Phytochemical analysis of aqueous extract of *Solanum trilobatum* leaf

The analysis of preliminary phytochemical screening using the acetone extract of *Solanum trilobatum* leaf concludes the presence of Carbohydrates, Tannins, Saponins, Alkaloids, Quinones, Phenols, & Steroids. The analysis of preliminary phytochemical screening using the aqueous extract of *Solanum trilobatum* leaf concludes the absence of Flavonoids, Glycosides & Terpenoids.

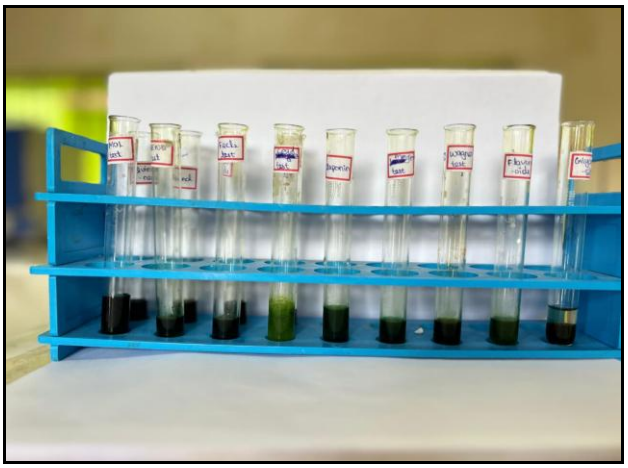

Fig. 4. Phytochemical analysis of the acetone extract of *Solanum trilobatum* leaf

The analysis of preliminary phytochemical screening using Chloroform extract of *Solanum trilobatum* leaf concludes the presence of Carbohydrates, Tannins, Alkaloids, Quinones, Phenols & Steroids. The analysis of preliminary phytochemical screening using Chloroform extract of *Solanum trilobatum* concludes the absence of Saponins, Flavonoids, Glycosides & Terpenoids.

Fig. 5. Phytochemical analysis of chloroform extract of *Solanum trilobatum* leaf

3.2 Antibacterial activity:

The antibacterial activity of ethanolic extract of *Solanum trilobatum* leaf were mentioned below in table 2

Table 2: **Antibacterial activity of ethanolic leaf extract of *Solanum trilobatum***

Name of the Microbes	Ethanolic extract of Solanum trilobatum leaf		
Concentration (µg /ml) / Bacteria	50	75	100
	Zone of Inhibition (mm)		
Bacillus subtilis	15	17	17
E. coli	17	19	20
Streptococcus pneumoniae	15	18	18
Klebsiella pneumoniae	17	18	19

By analyzing the size of the inhibition zone surrounding a well containing the test material, the agar well diffusion technique is a widely used, straightforward, and reliable way to gauge how well a substance inhibits bacterial growth [17]. According to the above table, ethanolic extracts from *Solanum trilobatum* leaf at different concentrations (50, 75, and 100 µg/ml) have been demonstrated to have antibacterial properties against a variety of bacteria, including Figure 6 (a) *Bacillus subtilis, (b) Escherichia coli, (c) Streptococcus pneumoniae* and *(d) Klebsiella pneumoniae.* The ethanolic leaf extract of *Solanum trilobatum* shows the greatest concentration of inhibitory zone (mm) at 100 µg/ml.

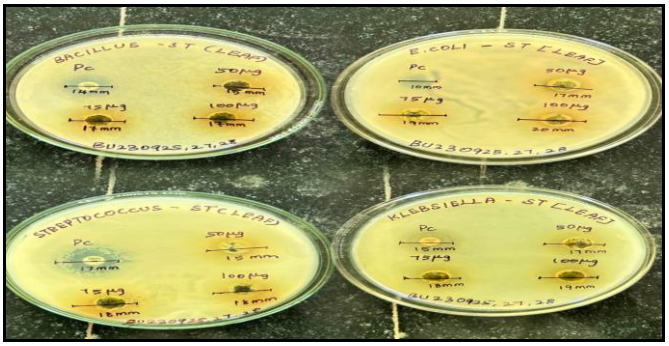

Fig. 6. Antibacterial activity of ethanolic leaf extract of *Solanum trilobatum*

4. Conclusion

Using various solvent extracts of *solanum trilobatum* leaf is abundant in phytochemicals including carbohydrate, tannins, alkaloids, phenols & Steroids is present in all various solvents. The analysis of preliminary phytochemical screening using ethanol extract of S*olanum trilobatum* leaf concludes that presence of Carbohydrates, Tannins, Saponins, Alkaloids, Quinones, Phenols & Steroids. The analysis of preliminary phytochemical screening using aqueous extract of S*olanum trilobatum* leaf concludes the presence of Carbohydrates, Tannins, Saponins, Alkaloids, Flavonoids, Phenols, Terpenoids & Steroids. The analysis of preliminary phytochemical screening using the acetone extract of S*olanum trilobatum* leaf concludes the presence of Carbohydrates, Tannins, Saponins, Alkaloids, Quinones, Phenols, Terpenoids & Steroids. The analysis of preliminary phytochemical screening using chloroform extract of S*olanum trilobatum* leaf concludes the presence of Carbohydrates, Tannins, Alkaloids, Quinones, Phenols & Steroids. The ethanolic extracts of *Solanum trilobatum* leaf form an inhibition zone against various bacterial strains like *Bacillus subtilis,*

Escherichia coli, Streptococcus pneumoniae and *Klebsiella pneumoniae.* The maximum zone of inhibition is formed at 100µg/mL.

Conflict of Interest: Nil

Acknowledgements

The authors would like to express their sincere thanks to the management, Sacred Heart College (Autonomous), Tirupattur for their constant support.

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