

## Research Article

### PHYSICOCHEMICAL & GC-MS ANALYSIS OF ETHANOLIC EXTRACT FROM WHOLE PLANT OF *SOLANUM TRILOBATUM* LINN

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Received 18<sup>th</sup> September 2020; Accepted 11<sup>th</sup> October 2020; Published online 13<sup>th</sup> November 2020

#### ABSTRACT

**Objective:** To qualitative and analysed the chemical composition in ethanolic extract from the whole plant of *Solanum trilobatum* Linn by gas chromatography-mass spectrometry (GC-MS). **Methods:** The shade dried whole plant powder was extracted with ethanol by using soxhlet extractor and crude ethanolic extract was obtained. **Results:** The extractive values were recorded in pet. ether, ethyl acetate, chloroform, ethanol and aqueous. Physicochemical parameters such as total ash, acid insoluble ash, water soluble ash, sulphated ash, foreign organic matter, loss on drying, crude fiber content and moisture content. GC-MS analysis of ethanolic extract of whole plant showed several active components. Among the identified compounds of ethanolic extract have 12 phytochemical compounds. **Conclusion:** The studies performed on whole plant of this constituents are medicinally important and many have reported biological activities. Thus GC-MS analysis revealed the existence of various types of constituents in *Solanum trilobatum* for ethanolic extract which confirm the application of this plant for a number of medicinal activities.

**Keywords:** Ethanolic extract, GC-MS analysis, phytochemical components, *Solanum trilobatum*.

#### INTRODUCTION

Herbal medicine or Phytomedicine is the use of plants for medicinal and therapeutic purpose for curing of diseases and improve human health. Plants have secondary metabolites called phytochemicals ('Phyto' from Greek - meaning 'Plant'). These compounds protect plants against microbial infections or infestations by pests. Phytochemicals are active ingredients which possess therapeutic properties that are considered as a medicine or drug. Phytochemicals have been reduced the risk of many human diseases include cardiovascular disease, hepato-renal diseases, diabetes, cancers and neurodegenerative disorders. However, several herbal medicines are being derived directly or indirectly from plants that are considered as an important medicine currently in use for curing various human diseases. *Solanum trilobatum*, also called as solanum (Tamil: Thuthuvalai) is one of the medicinal plant commonly available in different parts of the world and this plant is used in Indian system of medicine to cure various diseases in human and animals. Thuthuvalai or Climbing Brinjal is a medicinal plant commonly available in Southern India. The plant is full of thorns, including the leaves. It is used traditionally for curing numerous diseases such as asthma, cough and tuberculosis. For medicinal purpose whole plant is used. Various parts of the plant such as roots, berries and flowers are used for treating respiratory ailments. The decoction of berries and flowers is folk remedy for cough, hearing problems and chronic bronchitis. The leaves are given to increase fertility in males by treating watery semen and spermatorrhoea. In Siddha, medicated ghee of leaves is medicine for tuberculosis and lung congestion. The leaves and fruits of the plant contains many phytochemicals such as steroidal alkaloid and solasodine etc. due to which plant exhibits antimutagenic, anti-tumor, antibacterial and anti-fungal activities.

#### MATERIALS AND METHODS

##### Collection and preparation of plant material

The whole plant of *Solanum trilobatum* was collected from Rajapalayam, Virudhunager District of Tamil Nadu, India. Taxonomic distinguishing proof was produced from The American College, Madurai, Madurai District, Tamil Nadu. The plant of *Solanum trilobatum* were dried under shadow, segregated, crushed by a mechanical processor and went through a 40 lattice sifter. The plant powdered materials were put away in a hermetically sealed holder.

##### Extractive values of *Solanum trilobatum* Linn

Extractive values were recorded in pet. ether, ethyl acetate, chloroform, ethanol and aqueous with a view to study the distribution of various constituents of *Solanum trilobatum*. Accurately weigh 2.0gm of coarsely powdered air dried material was placed in a glass stoppered conical flask and macerated with 100ml of different solvents for 6 hours. Shacking frequently and then allowed to stand for 18 hours. The mixture was filtered rapidly. Then it was transferred to a tarred flat bottomed dish and evaporate to dryness on water bath. The residue was dried at 105°C for 6 hours. Cooled in a desiccator for 30 minutes and weighed without delay.

##### Physicochemical parameter of *Solanum trilobatum* Linn

Physicochemical screening of *Solanum trilobatum* revealed that, it possess good physicochemical parameters such as total ash, acid insoluble ash, water soluble ash, sulphated ash, loss on drying, foreign organic matter, swelling index and foaming index. The extractive values such as alcohol soluble extractive and water soluble extractive are also determined.

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## GC-MS ANALYSIS

### Extraction process

The whole plant powder of *Solanum trilobatum* were extracted with ethanol at temperature between 60-70°C by using soxhlet extractor. The solvent was evaporated by rotavapor to obtained viscous semi solid masses. The semi dry ethanolic crude extract from the whole plant of *Solanum trilobatum* analysed by GC-MS, it has led to the identification and characterization of 12 different organic compounds.

## RESULTS AND DISCUSSION

### Extractive values

The extractive values are valuable to estimate the chemical constituents present in the crude drug and furthermore assist in evaluation of definite constituents soluble in particular solvent. Extractive values were recorded in pet. ether, ethyl acetate, chloroform, ethanol and aqueous with a view to study the distribution of various constituents of *Solanum trilobatum*. Highest range of extractive values obtained in ethanolic extract is 8.112 % w/w

Table 1. Extractive values of *Solanum trilobatum* Linn

Extract	% ( $\pm$ SEM)*			Average yield (% w/w)
	1 (%w/w)	2 (% w/w)	3 (% w/w)	
Pet. ether extract	1.342	1.594	1.486	1.474
Ethyl acetate extract	3.593	4.204	4.637	4.144
Chloroform extract	2.586	2.745	3.147	2.826
Ethanol extract	7.843	8.167	8.325	8.112
Aqueous extract	4.129	4.502	4.672	4.434

### Physicochemical parameters

Physicochemical parameters of whole plant of *Solanum trilobatum* were estimated based on the methods recommended by World Health Organization (WHO) as apparent from Table 2, Percentage weight loss on drying and moisture content value was found to be  $9.22 \pm 1.25$  and  $79 \pm 1.90$ . The crude fibre content and foreign organic matter was found to be  $3.2 \pm 1.78$  and  $2.4 \pm 0.02$ . The ash values of total ash, water soluble ash, acid insoluble ash and sulphated ash value were found to be  $11.22 \pm 0.56$ ,  $3.89 \pm 0.24$ ,  $4.32 \pm 1.26$  and  $5.59 \pm 0.78$  respectively. Ash values used to find out quality, authenticity and purity of unsophisticated drug and also these values are important quantitative standards.

Table 2. Physicochemical parameters of *Solanum trilobatum* Linn

Experiments	% ( $\pm$ SEM)*			Average % ( $\pm$ SEM)*
	1 (%w/w)	2 (% w/w)	3 (% w/w)	
Total ash	10.92	11.27	11.46	$11.22 \pm 0.56$
Acid insoluble ash	3.91	3.84	3.94	$3.89 \pm 0.24$
Water soluble ash	4.35	4.28	4.31	$4.32 \pm 1.26$
Sulphated ash	5.65	5.53	5.58	$5.59 \pm 0.78$
Loss on drying	9.18	9.25	9.23	$9.22 \pm 1.25$
Crude fibre content	3.1	3.3	3.2	$3.2 \pm 1.78$
Moisture content	75	78	82	$79 \pm 1.90$
Foreign organic matter	2.4	2.3	2.4	$2.4 \pm 0.02$

## GC-MS ANALYSIS

From GC-MS analysis 12 active components were detected from ethanolic extract. The identification of phytochemical compounds was based on retention time, molecular formula, peak area, molecular weight and medicinal activity.

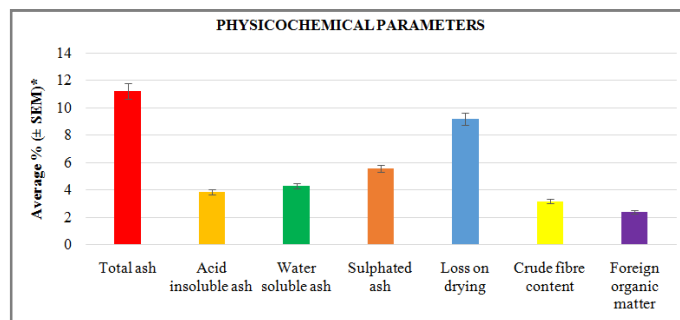


Fig. 1. Physicochemical parameters of *Solanum trilobatum* Linn.

### GC-MS analysis in ethanolic extract

Among the identified compounds, 5, 5'-propylenebis [(1H-1, 2, 4-triazol-3-yl) amine] was found to be the major compound attained the largest peak (19.05%) with the retention time (5.67) minutes. Another major compound 2-Myristinoyl-glycinamide having peak area of (18.50%) with retention time (13.66) minutes. Another compound Benzen eacetic acid, 2-hexenylester, (E) and Hexahydro pentalene-1, 6-dione having peak area (15.61 & 10.61%) with retention time (9.83) minutes. The compounds Cyclohexanamine, N-cyclooctylidene; 5-Azacytosine and 1- (3,3,3-Trifluoro-2-hydroxypropyl) piperidine having peak area (8.57%). The compound 2,3- Dimethylhydroquinone having peak area (4.40%). The compounds Ethanol, 2-(9-octadecenoxy)-, (Z)-; Cycloocta- 2,7-dienone; 2-Pentyne, 1-chloro and 9- octadecenoic acid (Z), methyl ester having peak area (0.94%) with retention time (3.92) minutes.

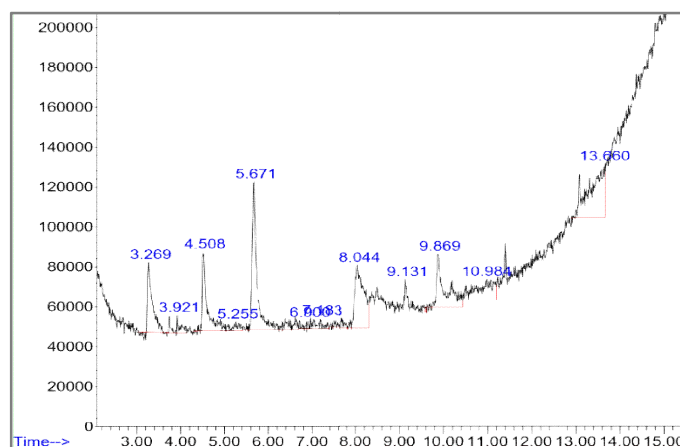


Fig. 2. GC-MS Chromatogram of ethanolic extract of *Solanum trilobatum* Linn

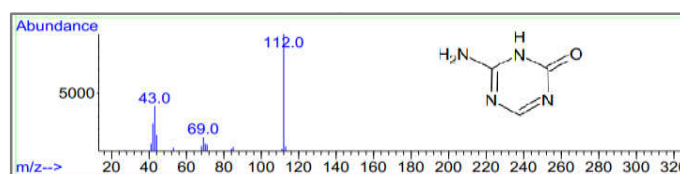


Fig. 3: 5-Azacytosine

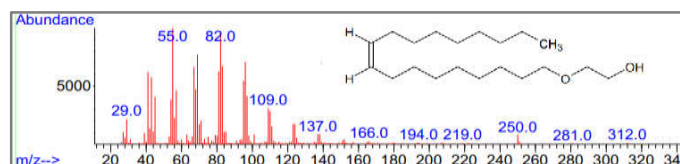


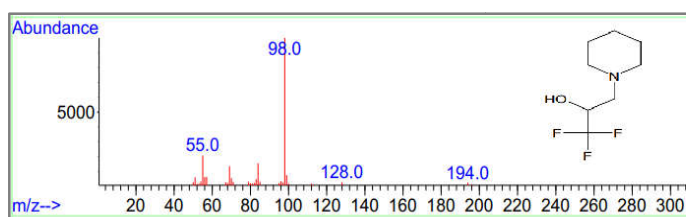
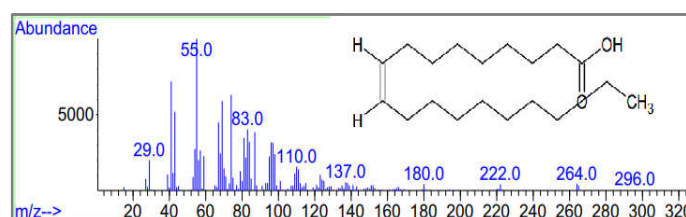
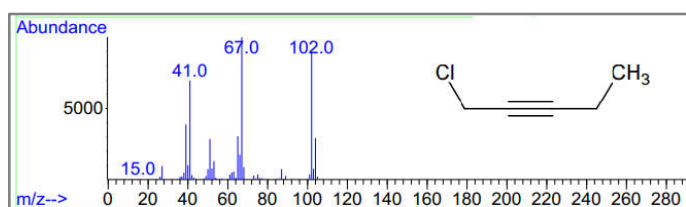
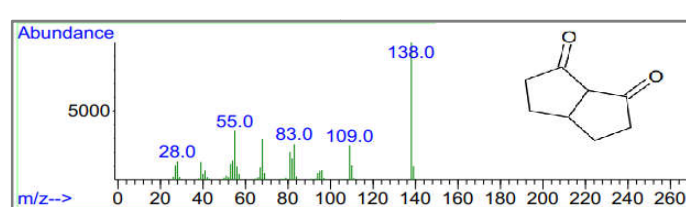
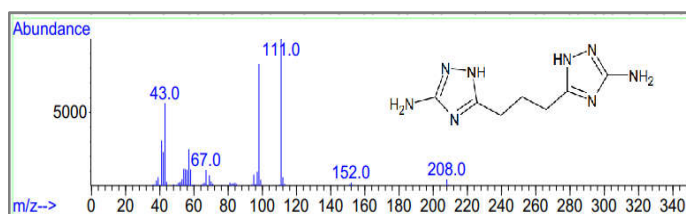
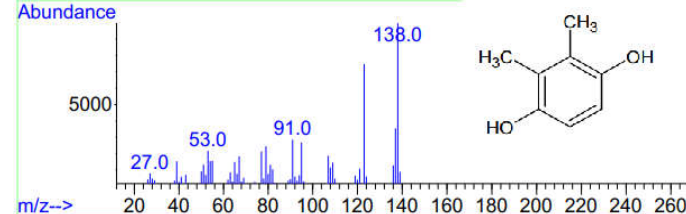
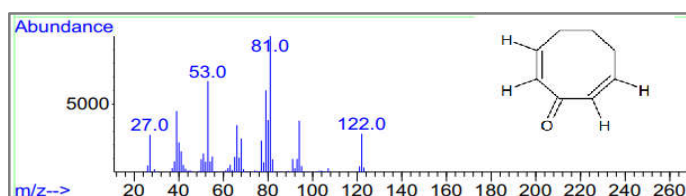
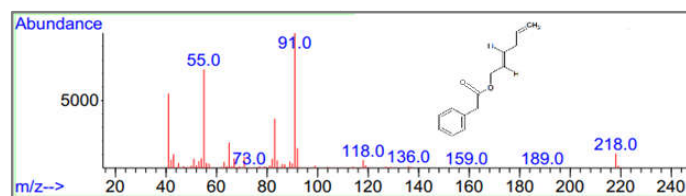
Fig. 4: Ethanol, 2-(9-octadecenoxy)-, (Z)-

**Table 3. Chemical composition of ethanolic extract of *Solanum trilobatum* Linn.**

S. No.	RT	Name of the compound	Molecular Formula	MW	PeakArea %
1.	3.269	5-Azacytosine	C <sub>3</sub> H <sub>4</sub> N <sub>4</sub> O	112	8.20
2.	3.921	Ethanol, 2-(9-octadecenyloxy)-, (Z)-	C <sub>20</sub> H <sub>40</sub> O <sub>2</sub>	312	2.14
3.	4.508	1-(3,3,3-Trifluoro-2-hydroxypropyl) piperidine	C <sub>8</sub> H <sub>14</sub> F <sub>3</sub> NO	197	9.72
4.	5.255	2-Pentyne, 1-chloro	C <sub>5</sub> H <sub>7</sub> Cl	102	0.97
5.	5.671	5,5'-propylenebis[(1H-1,2,4-triazol-3-yl)amine]	C <sub>7</sub> H <sub>12</sub> N <sub>8</sub>	208	19.05
6.	6.900	Cycloocta-2,7-dienone	C <sub>8</sub> H <sub>10</sub> O	122	0.70
7.	7.183	9- octadecenoic acid (Z)-, methyl ester	C <sub>19</sub> H <sub>36</sub> O <sub>2</sub>	296	1.62
8.	8.044	Hexahydro pentalene-1,6-dione	C <sub>8</sub> H <sub>10</sub> O <sub>2</sub>	138	15.61
9.	9.131	2,3- Dimethylhydroquinone	C <sub>8</sub> H <sub>10</sub> O <sub>2</sub>	138	4.40
10.	9.869	Benzeneacetic acid, 2-hexenylester, (E)-	C <sub>14</sub> H <sub>18</sub> O <sub>2</sub>	202	10.63
11.	10.984	Cyclohexanamine, N-cyclooctylidene	C <sub>14</sub> H <sub>25</sub> N	207	8.46
12.	13.660	2-Myristinoyl-glycinamide	C <sub>16</sub> H <sub>28</sub> N <sub>2</sub> O <sub>2</sub>	280	18.50

**Table 4. Activity of phytochemicals identified in ethanolic extract of *Solanum trilobatum* Linn.**

RT	Name of the compound	Nature of compound	Activity
3.269	5-Azacytosine	Amine	Antitumor, DNA methylation
3.921	Ethanol, 2-(9-octadecenyloxy)-,	Alcohol	Antigonorrhoeal, Anticancer
4.508	1-(3,3,3-Trifluoro-2-hydroxypropyl)piperidine	Alcohol	DNA polymerase
5.255	2-Pentyne, 1-chloro	Alkyne	Hepatitis-C
5.671	5,5'-propylene bis[(1H-1,2,4-triazol-3-yl)amine]	Triazole	Antiinflammatory
6.900	Cycloocta-2,7-dienone	Ketone	Antimicrobial
7.183	9-octadecenoic acid(Z)-, methylester	Fatty Ester	Hepatoprotective, Antihistaminic
8.044	Hexahydro-pentalene-1,6-dione	Diketone	Antidiabetic
9.131	2,3-Dimethylhydroquinone	Diol	Antimicrobial
9.869	Benzeneacetic acid, 2-hexenylester,(E)-	Ester	Antimicrobial
10.984	Cyclohexanamine, N-cyclooctylidene	Azepine	Bronchodilators, Analgesics, Mucolytics
13.660	2-Myristinoyl-glycinamide	Amide	Antibacterial

**Fig. 5. (3,3,3- Trifluoro-2-hydroxypropyl) piperidine****Fig. 9. 9-octadecenoic acid (Z)-, methyl ester****Fig. 6. 2-Pentyne, 1-chloro****Fig. 10. Hexahydro-pentalene-1,6-dione****Fig. 7. 5,5'- propylenebis[(1H-1,2,4-triazol-3-yl)amine]****Fig. 11. 2,3- Dimethylhydroquinone****Fig. 8. Cycloocta- 2,7- dienone****Fig. 12. Benzene acetic acid, 2-hexenylester, (E)-**



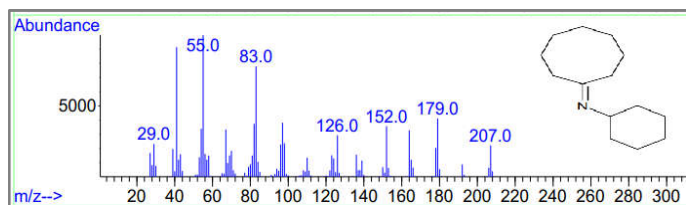


Fig.13. Cyclohexanamine, N-cyclo octylidene

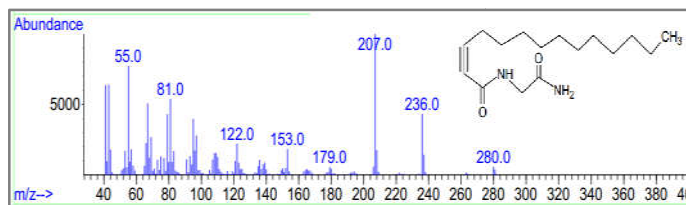


Fig. 14. 2-Myristinoyl-glycinamide

## CONCLUSION

In this research studies performed on whole plant of this plant are anti-inflammatory activity, anti-cancer activity, bronchodilators, analgesics, mucolytics, anti-histaminic, hepatitis-C, DNA polymerase, anti-tumor activity, DNA methylation antimicrobial activity and anti-diabetic activity. Ethno pharmacological 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 general believed to be safe for human use. Traditionally, plants are used in the treatment of many infections and systemic disorders. More than hundreds of chemical compounds are derived from plants which have medicinal values due to their health-enhancing and therapeutic properties are referred as herbs. Through screening of literature available on *Solanum trilobatum* Lindepicted the fact that it is a popular remedy among the various ethnic groups Siddha and Ayurvedic properties.

## Acknowledgements

The gratitude to Associate professor Dr. J. Amutha Iswarya Devi, M.Pharm., Ph.D., Departement of Pharmaceutical Chemistry, Arulmigu Kalasalingam College of Pharmacy, Krishnakoil. Testing Laboratory and The Director, Science Instrumentation Centre of Ayya Nadar Janaki Ammal College (ANJAC), Sivakasi, for providing the laboratory facilities (GC-MS) and support to carry out the work.

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