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Short Communication

GC-MS analysis of bioactive compounds present in the methanolic extract of *Talinum fruticosum L.*

Sebastin Varghese

Department of Pharmaceutical Chemistry, Malik Deenar College of Pharmacy, Kasaragod, India.

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***Corresponding Author:**
Dr Sebastin Varghese
Email: Seba.pharm@gmail.com
Phone: +91- 9995727858

ABSTRACT

Objective: The study aimed to evaluate the phytochemical composition and identify potential bioactive compounds present in the methanolic extract of *Talinum fruticosum* L. (Talinaceae), a leafy vegetable valued for its nutritional and medicinal properties. **Methods:** Fresh leaves of *T. fruticosum* were extracted using methanol, and the extract was subjected to preliminary phytochemical screening to identify major classes of phytoconstituents. Further characterization of bioactive compounds was performed using gas chromatography–mass spectrometry (GC–MS) analysis. **Results:** Phytochemical screening confirmed the presence of flavonoids, flavones, phenols, saponins, carbohydrates, proteins, and terpenoids. GC–MS analysis revealed 19 bioactive constituents, including Z,Z-4,16-octadecadien-1-ol acetate, meso-2,5-dimethyl-3,4-hexanediol, N-hexadecanoic acid, phytol, E-2-octadecadecen-1-ol, trichlorodocosyl silane, and undecane. These compounds are reported to exhibit significant pharmacological properties such as antidiabetic, antioxidant, antimicrobial, and anti-inflammatory activities. **Conclusion:** The findings support the traditional use of *T. fruticosum* as a medicinal plant and highlight its potential as a natural source of therapeutically active compounds. Further studies are recommended to isolate and characterize individual components and assess their pharmacological efficacy through *in vivo* investigations.

1. INTRODUCTION

Medicinal plants have been integral to traditional healthcare systems for centuries. Their expanding use in food, cosmetic, and pharmaceutical industries underscores the need to identify and characterize the active constituents responsible for their medicinal effects. Historically, plants have yielded numerous successful drugs and continue to be invaluable for discovering novel bioactive compounds (Atanasov et al., 2015).

Talinum fruticosum L. (Talinaceae) (Figure 1) is an erect, fleshy, perennial herb valued both as a leafy vegetable and a medicinal plant. It is rich in vitamins A and C and minerals such as iron and calcium (Leite et al., 2009). Beyond its nutritional profile, *T. fruticosum* L. contains flavonoids, alkaloids, tannins, and saponins, contributing to a wide spectrum of pharmacological

activities. Traditionally, it is employed for its antioxidant, anti-inflammatory, antimicrobial, and antidiabetic properties, as well as for wound healing, anemia management, digestive health, and lactation enhancement (Manikandan et al., 2025).

Figure 1: *Talinum fruticosum L.* plant showing its characteristic glossy green leaves and pink flowers.

The pharmacological potential of *T. fruticosum* L. is supported by reports of its ability to neutralize free radicals, reduce inflammation, regulate blood glucose levels, and inhibit microbial growth (Farid et al., 2015). Nevertheless, scientific validation through *in vivo* studies is needed.

Gas chromatography–mass spectrometry (GC–MS) is a powerful analytical tool for identifying volatile and semi-volatile compounds in plant extracts (Hethelyi et al., 1987). The present study aims to evaluate the phytochemical composition of *T. fruticosum* L. and identify volatile and semi-volatile bioactive constituents using GC–MS, providing deeper insight into its medicinal potential.

2. MATERIAL AND METHODS

2.1 Chemicals

All the chemicals and reagents used for the research were of analytical grade.

2.2 Collection of plant materials

The whole plants of *Talinum fruticosum.L were* collected in Tirunelveli (Tamilnadu, India). The plant material was taxonomically identified by Botanist V. Chelladurai, Research Officer-Botany (Scientist-C), Central Council of Research in Ayurveda & Siddha, Govt of India, Thirunelveli - Tamil Nadu, and dried in the shade for about 10 days, pulverized using a mechanical grinder, and stored in an airtight container.

2.3 Preparation of plant materials

Extraction of the dried powder of *Talinum fruticosum.L was* carried out with the aid of a Soxhlet apparatus using methanol as solvent. Two extraction runs were performed. About 25 g of the dried powder was weighed, moistened with the respective solvent, and placed in the Soxhlet extractor, and then extracted with 500 ml of methanol (Buss & Butler, 2010). The extracts were then filtered, the solvent distilled off, and finally, the dry extract was obtained. The percentage yield of each extract was calculated. The crude extracts and the separated layers were analyzed using GC-MS.

2.4 Phytochemical screening

The methanol extract was tested for various phytoconstituents such as steroids, triterpenoids, flavonoids, and tannins using a standard method (Harborne, 1998). Qualitative phytochemical tests followed Harborne (1998) and Trease & Evans (2009) (Evans, 2009). Characteristic color reactions were observed: alkaloids (Dragendorff's test), flavonoids (Shinoda test), tannins (Ferric chloride test), saponins (frothing test), and terpenoids (Salkowski test). All analyses were performed in triplicate to ensure reproducibility.

2.5 GC-MS Analysis

The chemical profiling of the extract was performed using a Perkin Elmer TurboMass spectrophotometer (Norwalk, CT 06859, USA) coupled with an Autosampler XLGC. The separation was carried out on a Clarus 680 GC system fitted with an Elite-5MS capillary column (30 m length × 0.25 mm internal diameter × 0.25 µm film thickness; stationary phase: 5% biphenyl and 95% dimethylpolysiloxane). High-purity helium served as the carrier gas at a constant flow rate of 1.0 ml/min. The injector was operated at 260 °C, and 1 µl of the sample solution was introduced for analysis. The oven program was set as follows: initial temperature 60 °C (held for 2 min), increased to 300 °C at a rate of 10 °C/min, and maintained at 300 °C for 6 min. The mass spectrometer was operated under the following conditions: transfer line temperature 230 °C, ion source temperature 230 °C, electron impact ionization at 70 eV, with a scan time of 0.2 s and a scan interval of 0.1 s. The detector scanned ions in the mass range of 40–600 Da. Compound identification was performed by comparing the obtained mass spectra with reference spectra from the NIST (2008) GC–MS library. Quantitative analysis was based on peak area

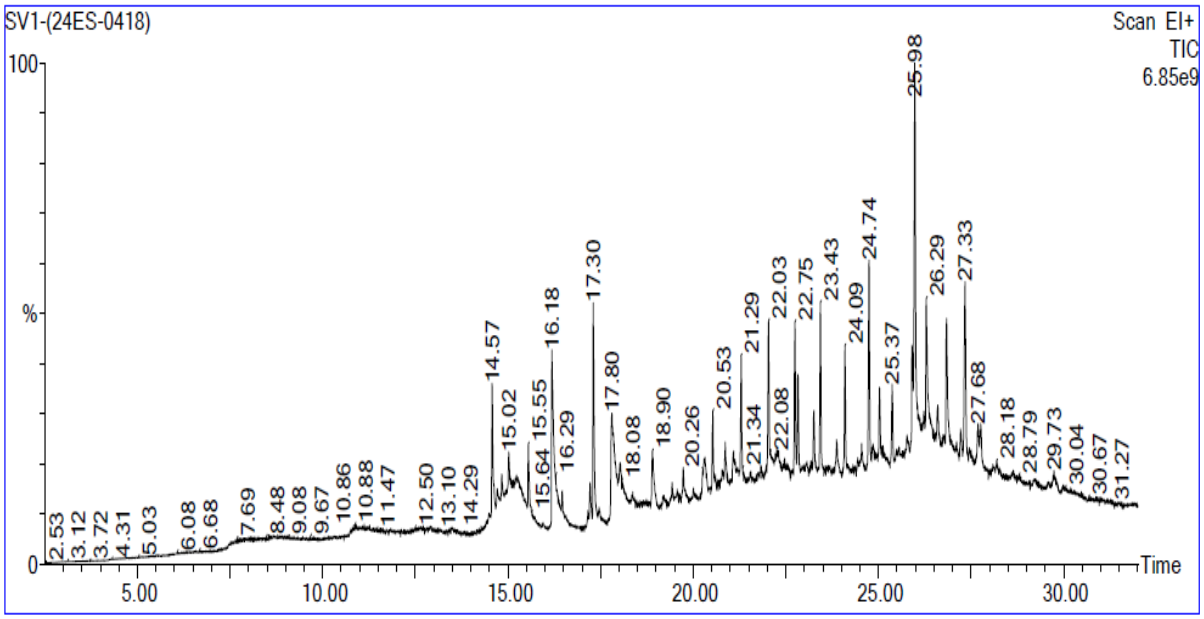


Figure 2: GC-MS chromatogram of methanolic extract of *Talinum fruticosum.L*.

Table 1: Preliminary phytochemical screening results of the methanolic extract of *Talinum fruticosum* L.

Phytochemical Test	Observation (Method)	Result (+/–)
Alkaloids (Dragendorff's)	Orange precipitate formation	-
Flavonoids (Shinoda)	Pink/red color formation	+
Tannins (Ferric chloride)	Blue-black color	+
Glycosides (Keller–Killiani test)	brown ring at the interface	-
Saponins (Frothing)	Persistent foam	+
Terpenoids (Salkowski)	Reddish-brown interface	+
Phenols ($FeCl_3$ test)	Green color	+
Gums and mucilage (Ethanolic precipitation test)	white or cloudy precipitate	-
Volatile oils (Sodium hydroxide–hydrochloric acid test)	white precipitate or turbidity formation	-
Proteins (Biuret test)	Violet color	+
Carbohydrates (Benedict's)	Brick-red precipitate	+

(+ indicates presence of compound class , - indicates absence of compound)

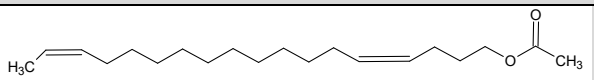
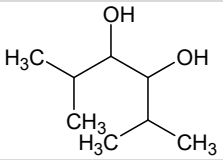
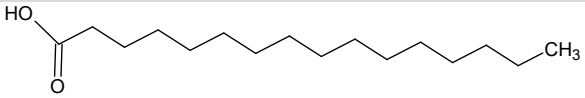
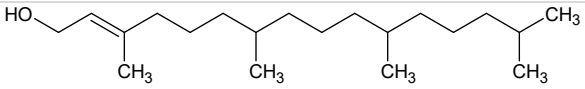
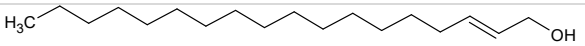
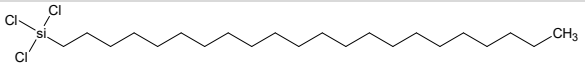
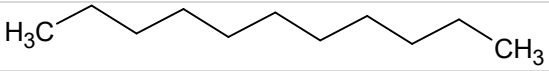
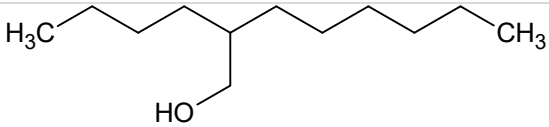
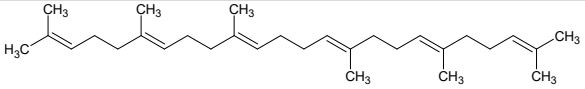
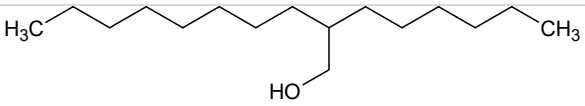
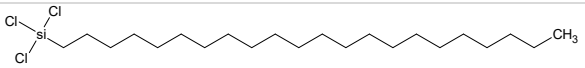
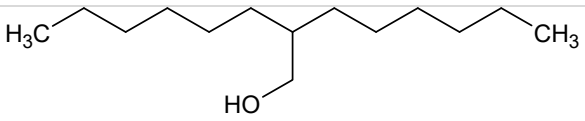
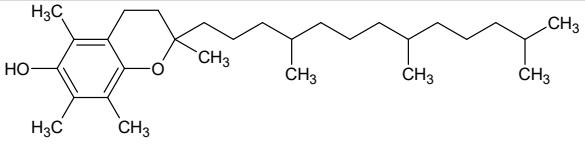
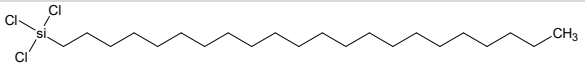
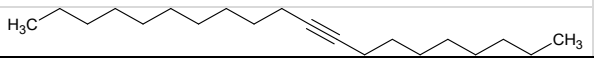
measurements, and data handling was carried out using Turbo-Mass OCPTVS-Demo SPL software (Casuga et al., 2016).

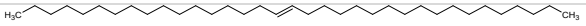
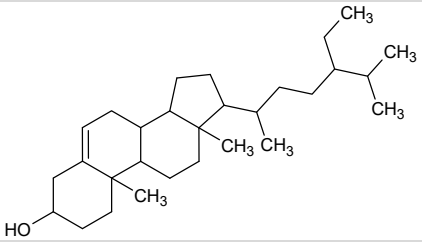
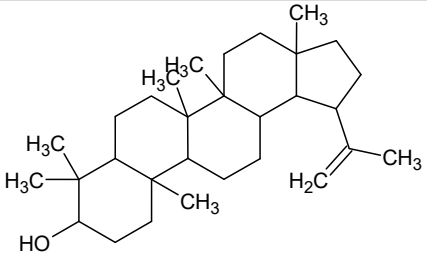
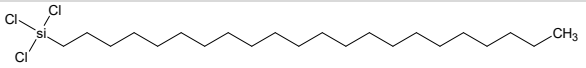
3. RESULTS

3.1 Phytochemical Screening Results

The percentage yield of the methanolic extract was 12.4 % (w/w). Later, phytochemical analysis was carried out. The preliminary phytochemical screening of the methanolic extract of *Talinum fruticosum L.* revealed the presence of several major classes of secondary metabolites. As shown in Table 1, the extract tested positive for flavonoids, tannins, saponins, terpenoids, phenols, proteins, and carbohydrates, indicated by their characteristic color changes or precipitate formation during respective qualitative assays. In contrast, the extract tested negative for alkaloids, glycosides, gums and mucilage, and volatile oils, as their respective assays showed no characteristic precipitates or color changes.

Table 2: Bioactive compounds found in the methanolic extract of *Talinum fruticosum. L.*

Sl. No	RT (Min)	Name of the compound	Molecular formula	Molecular weight	Peak area	Structure of the compound
1	14.57	Z,Z-4,16-OCTADECADIEN-1-OL ACETATE	C20H36O2	308	4.088	
2	15.55	MESO-2,5-DIMETHYL-3,4-HEXANEDIOL	C8H18O2	146	2.162	
3	16.18	N-HEXADECANOIC ACID	C16H32O2	256	11.122	
4	17.29	PHYTOL	C20H40O	296	6.098	
5	17.804	E-2-OCTADECADECEN-1-OL	C18H36O	268	7.986	
6	21.291	SILANE, TRICHLORODOCOSYL	C22H45Cl3Si	442	3.667	
7	22.031	UNDECANE	C11H24	156	5.029	
8	22.746	1-OCTANOL, 2-BUTYL	C12H26O	186	3.967	
9	22.826	SQUALENE	C30H50	410	2.598	
10	23.432	1-DECANOL, 2-HEXYL	C16H34O	242	4.510	
11	24.092	SILANE, TRICHLORODOCOSYL	C22H45Cl3Si	442	3.717	
12	24.742	2-HEXYL-1-OCTANOL	C14H30O	214	6.194	
13	25.027	VITAMIN E	C29H50O2	430	2.127	
14	25.367	SILANE, TRICHLORODOCOSYL	C22H45Cl3Si	442	2.508	
15	25.903	9-EICOSYNE	C20H38,	278	3.348	

16	25.978	17-PENTATRIACONTENE	C35H70	490	13.41	
17	26.288	GAMMA.-SITOSTEROL	C29H50O	414	5.532	
18	26.838	LUPEOL	C30H50O	426	4.824	
19	27.33	SILANE, TRICHLORODOCOSYL	C22H45Cl3Si	442	7.115	

3.2 Gas chromatography-mass spectroscopy analysis

In the GC-MS analysis of the methanol fraction of *Talinum fruticosum.L*, a total of 19 compounds were identified, showing different phytochemical activities. The chromatogram is shown in Figure 2, and the chemical constituents, along with their retention times (RT), molecular formulas, molecular weights (MW), and concentrations (%) in MFHAL, are listed in Table 2. The following bioactive compounds were found in the GC-MS analysis of the methanol fraction of *Talinum fruticosum.L*; Z,Z-4,16-Octadecadien-1-Ol Acetate, Meso-2,5-Dimethyl-3,4-Hexanediol, N-Hexadecanoic Acid, Phytol, E-2-Octadecadecen-1-Ol, Silane, Trichlorodocosyl, Undecane, 1-Octanol, 2-Butyl, Squalene,1-Decanol 2-Hexyl,Silane,Trichlorodocosyl,2-Hexyl-1-Octanol, Vitamin E,Silane, Trichlorodocosyl,9-Eicosyne, 17-Pentatriacontene, Gamma.-Sitosterol, Lupeol, Silane, Trichlorodocosyl.

4. DISCUSSION

The phytochemical and GC–MS analyses of *T. fruticosum* L. revealed a diverse range of bioactive compounds, confirming its potential as a multifunctional medicinal plant. The presence of phenolic compounds and flavonoids supports the plant's antioxidant potential, which may contribute to the prevention of oxidative stress–related diseases.

Compounds such as N-hexadecanoic acid, phytol, squalene, γ-sitosterol, and lupeol are well-documented for their anti-inflammatory, antioxidant, and antidiabetic properties (Olivia et al., 2021; Uma & Balasubramaniam, 2012). For instance, N-hexadecanoic acid exhibits anti-inflammatory and antimicrobial activity (Momin et al., 2014), while lupeol has hepatoprotective and anti-arthritic effects (Buss & Butler, 2010). Phytol and vitamin E enhance the antioxidant capacity of the extract (Casuga et al., 2016). These findings corroborate the traditional uses of *T. fruticosum* in the management of diabetes, inflammation, and infections (Farid et al., 2015; Manikandan et al., 2025). Similar GC–MS analyses of Talinum triangulare and related species reported the presence of compounds such as phytol and squalene (Manikandan et al., 2025), indicating chemotaxonomic consistency within the genus.

Rather than merely listing known effects, these compounds are likely to act synergistically, supporting the plant's ethnomedicinal applications and its potential for developing natural antioxidant and antidiabetic formulations.

5. CONCLUSION

The present study confirms that *Talinum fruticosum.L* contains a wide spectrum of bioactive compounds with promising medicinal properties. The results from phytochemical screening and GC-MS profiling provide strong evidence supporting its traditional uses for treating various health conditions. These findings position *Talinum fruticosum.L* as a valuable resource for both pharmaceutical and

nutraceutical applications. However, to fully harness its medicinal potential, further studies, including *in vivo* experiments and clinical trials, are essential to evaluate its efficacy and safety in human health.

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Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

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