



Characterization of Phytochemical compounds in *Desmodium gangeticum* Leaf Extract Using GC-MS Analysis

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Manuscript details:

Received: 27.02.2026

Accepted: 28.03.2026

Published: 30.03.2026

Cite this article as:

Ambhore AT and Pawade PN (2026) Characterization of Phytochemical compounds in *Desmodium gangeticum* Leaf Extract Using GC-MS Analysis. *Int. J. of Life Sciences*, 14 (1): 69-72.

Available online on <http://www.ijlsci.in>

ISSN: 2320-964X (Online)

ISSN: 2320-7817 (Print)



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ABSTRACT

This study aimed to explain the phytochemical profile of *Desmodium gangeticum* leaf ethanol extract using Gas Chromatography Mass Spectrometry (GC-MS) analysis. *Desmodium gangeticum* commonly as wild forage plant, is traditionally recognized for its medicinal properties, including anti-inflammatory and anti-diabetic effects. Leaves were collected from Borgaon, Amravati, India, and subjected to ethanol extraction. GC-MS analysis identified a complex mixture of sixteen compounds, with Silane, diethylmethy (59.3374 %) being the most abundant, followed by Furan, Furan, 2,3-dihydro (17.8980 %) and 2-myristynoyl pantetheine (9.70%). Other notable compounds included pregna-6,16diene-11,20-diol, octanoic acid, ethyl ester, and β -N-acetylneuraminic acid derivatives. The identified compounds suggest a range of pharmacological activities, such as antimicrobial, anti-inflammatory, antiviral, and immune-modulating effects. This comprehensive phytochemical characterization underscores the therapeutic potential of *Desmodium gangeticum* leaf extract, warranting further research to isolate these bioactive compounds and evaluate their individual and synergistic effects in various biological models. The findings contribute to a deeper understanding of the medicinal properties of *Desmodium gangeticum* and support its potential use in pharmaceutical and nutraceutical applications.

Keywords: *Desmodium gangeticum*, GC-MS analysis, phytochemical profiling, ethanolic extract, bioactive compounds.

INTRODUCTION

Desmodium gangeticum is an important forage plant commonly consumed by grazing animals and belongs to the family Fabaceae (Leguminosae). It is widely distributed in tropical and subtropical regions, where it commonly grows in agricultural lands, roadsides, grasslands, and other disturbed habitats. Besides its value as a forage species, *Desmodium gangeticum* has long been recognized in traditional medicine for its diverse therapeutic properties, including anti-inflammatory, antipyretic, digestive, and respiratory health benefits. Phytochemical analysis plays a crucial role in identifying the bioactive constituents present in medicinal plants and in understanding their potential therapeutic significance. Among the analytical techniques available, Gas Chromatography–Mass Spectrometry (GC–MS) is considered a powerful and reliable method for the identification and quantification of various phytochemical compounds in plant extracts.

The medicinal importance of *Desmodium gangeticum* is mainly attributed to the presence of several bioactive compounds such as alkaloids, flavonoids, phenolic compounds, terpenoids, glycosides, and saponins. These phytochemicals are known to exhibit a wide range of pharmacological activities, including antioxidant, anti-inflammatory, antimicrobial, and anticancer effects. Although several studies have investigated the phytochemical composition and pharmacological properties of *Desmodium gangeticum* using different extraction methods and analytical approaches, detailed GC-MS profiling of the leaf ethanol extract remains limited. Therefore, the present study was undertaken to characterize the phytochemical constituents of the ethanol leaf extract of *Desmodium gangeticum* through GC-MS analysis. The study aims to identify and quantify the major bioactive compounds responsible for the medicinal properties of the plant. The findings of this investigation may contribute to a better understanding of the therapeutic potential of *Desmodium gangeticum* and support its future application in pharmaceutical, nutraceutical, and herbal formulations.

MATERIALS AND METHODS

Collection of Plant *Desmodium gangeticum* Material leaves were collected from Borgaon, District Amravati, Maharashtra, India. Healthy and mature leaves were carefully handpicked to minimize contamination and damage.

Preparation of Leaf Extract

The collected *Desmodium gangeticum* leaves were thoroughly washed with distilled water to remove any adhering dirt or debris. After drying at room temperature, the leaves were finely ground into powder using a mechanical grinder. The powdered plant material was then subjected to ethanol extraction using a Soxhlet extractor. Ethanol was chosen as the solvent due to its ability to extract a wide range of phytochemicals. The extraction process was carried out to ensure efficient extraction of bioactive compounds. The resulting ethanol extract was filtered, and the solvent was evaporated under reduced pressure using a rotary evaporator to obtain a concentrated extract.

GC-MS Analysis

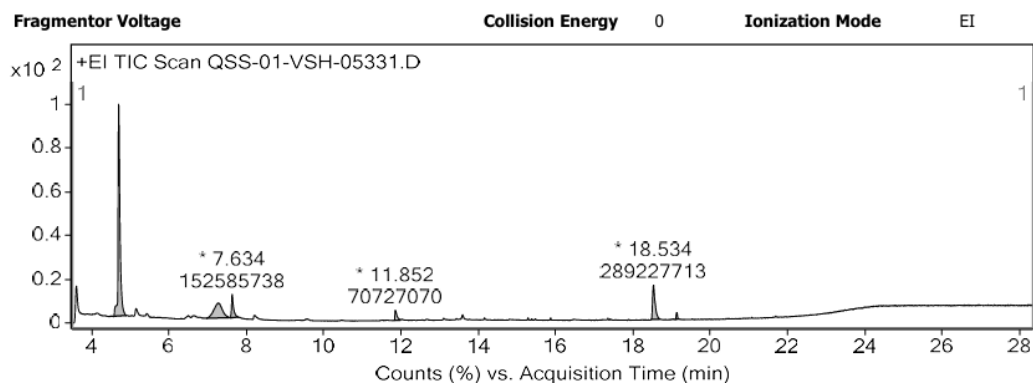
In the present investigation, Gas Chromatography-Mass Spectrometry (GC-MS) analysis was carried out

to identify and characterize the phytochemical constituents present in the ethanol leaf extract of *Desmodium gangeticum*. Prior to analysis, the crude extract was dissolved in a suitable solvent, commonly methanol, to obtain an appropriate concentration for efficient chromatographic separation. The GC-MS system, equipped with a suitable capillary column and optimized operating conditions such as oven temperature programming, carrier gas flow rate, and detector parameters, was employed to achieve accurate separation and detection of the compounds present in the extract.

The chromatographic conditions were carefully standardized to ensure proper resolution and reproducibility of peaks. Mass spectral analysis was performed using Electron Ionization (EI) mode, which generated characteristic fragmentation patterns for the detected compounds. Identification of the phytochemical constituents was accomplished by comparing the obtained retention times and mass spectra with reference data available in the NIST Mass Spectral Library and published literature. This analytical approach enabled the reliable identification of various bioactive compounds present in the ethanol leaf extract of *Desmodium gangeticum* and provided valuable insight into its phytochemical composition and potential therapeutic significance.

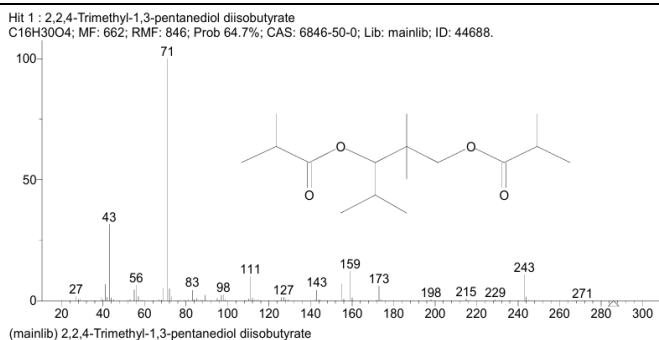
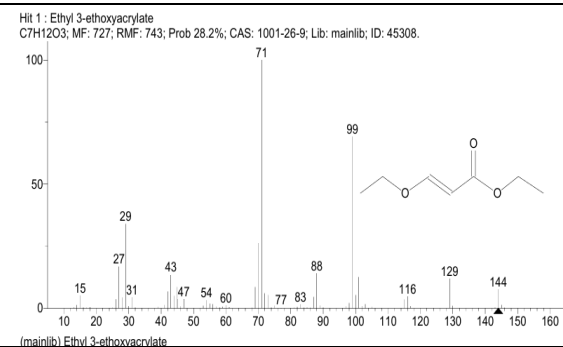
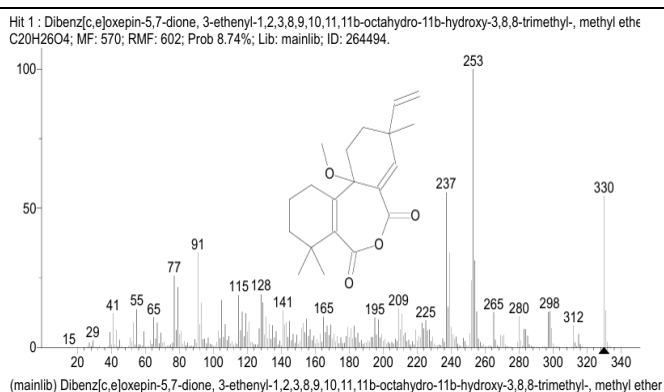
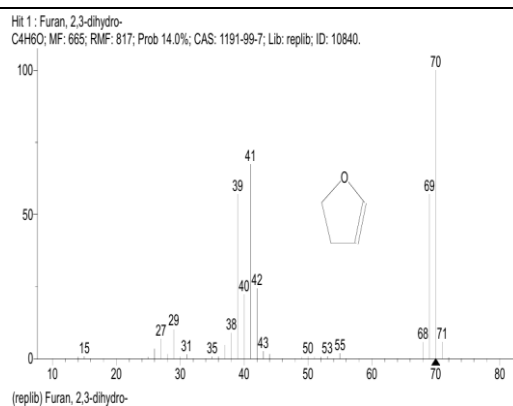
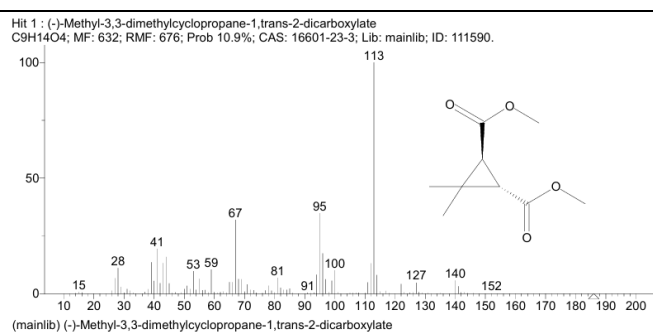
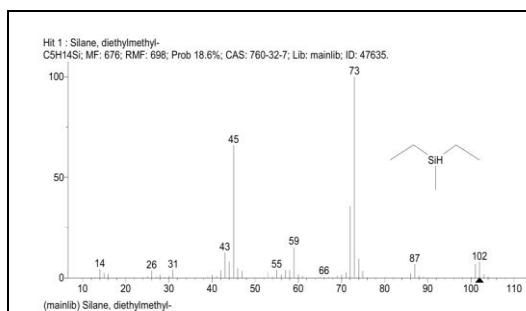
RESULTS AND DISCUSSION

The GC-MS analysis of the ethanolic extract of *Desmodium gangeticum* leaf revealed a complex mixture of compounds. A total of six distinct compounds were identified, each characterized by its retention time (RT), molecular weight, molecular formula, and peak area percentage. The identified compounds and their corresponding data are presented in Table 1 and Fig.1. The most abundant compound in the extract was Silane, diethylmethyl, which accounted for 59.3374% of the total peak area. This was followed by Furan, 2,3-dihydro, with a peak area percentage of 17.8980% and, Dibenz[c,e]oxepin-5,7-dione, 3-ethenyl-1,2,3,8,9,10,11,11b octahydro-11b-hydroxy-3,8,8 trimethyl which represented 12.1988% of the extract. Other notable compounds included Ethyl 3-ethoxyacrylate (6.4356%), and Several compounds were present in smaller quantities, such as (-)-Methyl-3,3-dimethylcyclopro, 2,2,4-Trimethyl-1,3-pentanediol (1.1471%)



Integration Peak List

Peak	RT	End	Area	Area %	Name of Compound	MW
1	4.699	4.894	1,406,861,967	59.3374	Silane, diethylmethyl	102
2	7.264	7.546	424,353,305	17.8980	Furan, 2,3-dihydro	70
3	7.634	7.792	152,585,738	6.4356	Ethyl 3-ethoxyacrylate	144
4	11.852	11.986	70,727,070	2.9831	(-)-Methyl-3,3-dimethylcyclopropane	186
5	18.534	18.675	289,227,713	12.1988	Dibenz[c,e]oxepin-5,7-dione, 3-ethenyl-1,2,3,8,9,10,11,11b-octahydro-11b-hydroxy-3,8,8-trimethyl	330
6	19.138	19.187	27,197,969	1.1471	2,2,4-Trimethyl-1,3-pentanediol	286



The compounds identified through GC-MS analysis exhibit several potential pharmaceutical and biological applications due to their diverse chemical properties. Silane, diethylmethyl derivatives are commonly associated with antimicrobial activity and are also used in pharmaceutical synthesis and drug delivery systems. Furan, 2,3-dihydro compounds possess antioxidant, antimicrobial, and anti-inflammatory properties, making them useful in medicinal chemistry. Ethyl 3-ethoxyacrylate is an important intermediate in the synthesis of pharmaceutical drugs and biologically active molecules. (-)-Methyl-3,3-dimethylcyclopropane derivatives are known for their role in the preparation of therapeutic agents and bioactive compounds with potential antimicrobial effects. Dibenz[c,e]oxepin-5,7-dione compounds exhibit notable anticancer, anti-inflammatory, and antimicrobial activities and are widely studied for medicinal applications. The compound 3-ethenyl-1,2,3,8,9,10,11,11b-octahydro-11b-hydroxy-3,8,8-trimethyl is structurally related to terpenoid compounds, which are recognized for antioxidant, anti-inflammatory, and anticancer properties. Similarly, 2,2,4-Trimethyl-1,3-pentanediol derivatives are utilized in pharmaceutical formulations, drug stabilization, and antimicrobial preparations. Overall, these phytochemical compounds indicate significant pharmaceutical potential and may contribute to the development of novel therapeutic agents.

CONCLUSION

The GC-MS analysis of the ethanolic extract of *Desmodium gangeticum* revealed a complex and diverse composition of bioactive compounds, with a total of six substances. The extract was predominantly composed which are known for their antimicrobial and anti-inflammatory properties. The most abundant compound was Silane, diethylmethyl. Furan, 2,3-dihydro, Ethyl 3-ethoxyacrylate. Methyl-3,3-dimethylcyclopropane,3-ethenyl-1,2,3,8,9,10,11,11b-octahydro-11b-hydroxy-3,8,8-trimethyl, 2,2,4-Trimethyl-1,3-pentanediol.

The identification of these diverse compounds indicates that the ethanolic extract of *Desmodium gangeticum* leaf could have multifaceted pharmacological effects, supporting its traditional use in herbal medicine. Future research should focus on isolating these individual compounds and investigating their specific biological activities and

potential synergistic effects. This could lead to the development of novel therapeutic agents derived from the *Desmodium gangeticum* leaf.

Conflict of interest

The authors declare no competing interests.

Data Availability Statement: Not applicable.

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