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Research Paper

Phytochemical Analysis And GC-MS Profiling of *Themeda Triandra (Forssk.)* Leaf

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ABSTRACT

Themeda triandra (Forssk.), commonly known as kangaroo grass, is a perennial grass species with potential medicinal properties. This study aims to characterize the phytochemical composition of Themeda triandra leaf ethanol extract using Gas Chromatography-Mass Spectrometry (GC-MS). The GC-MS analysis revealed the presence of 13 bioactive compounds, including silanes, esters, alcohols, steroids, and nitrogen-containing compounds, which are known for their antimicrobial, antioxidant, anti-inflammatory, and anticancer properties. Notably, compounds such as Silane, Diethylmethyl and Aclarubicin were identified, suggesting the plant's potential therapeutic applications. These findings provide a detailed chemical profile of Themeda triandra and support its traditional use in medicine. The study paves the way for further research on the pharmacological potential of the plant's bioactive constituents

INTRODUCTION

Themeda triandra (Forssk.), commonly known as kangaroo grass, is a perennial grass species belonging to the Poaceae family. It is widely distributed across tropical and subtropical regions, thriving in grasslands, open forests, and disturbed habitats. This grass species has been traditionally recognized for its ecological significance and potential medicinal properties, including its role in soil stabilization, fodder supply, and various ethnobotanical applications. Phytochemical analysis plays a crucial role in understanding the bioactive constituents present in medicinal plants, thereby providing insights into their therapeutic potential. Among the diverse analytical techniques used for phytochemical profiling, Gas Chromatography-Mass Spectrometry (GC-MS) stands out as a powerful tool for identifying and quantifying a wide range of chemical compounds within plant extracts. The medicinal properties of Themeda triandra are attributed to its rich phytochemical composition, including alkaloids, flavonoids, phenolic compounds, saponins, and

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terpenoids. These bioactive compounds are known for their antioxidant, anti-inflammatory, antimicrobial, and other pharmacological properties. While previous studies have explored the ecological and nutritional significance of Themeda triandra, limited research has been conducted on its phytochemical characterization using GC-MS techniques. To bridge this research gap, the present study aims to perform a comprehensive GC-MS analysis of Themeda triandra (Forssk.) leaf extract to identify and quantify its bioactive constituents. By elucidating the chemical profile of the extract, this study seeks to enhance our understanding of the therapeutic potential of Themeda triandra and contribute to its possible applications in pharmaceutical and nutraceutical industries.

MATERIALS AND METHODS

Collection of Plant Material

The leaves of Themeda triandra (Forssk.) were collected from Borgaon, District Amravati, Maharashtra, India. Healthy and mature leaves were carefully handpicked to minimize contamination and damage, ensuring the integrity of the plant material for further analysis.

Preparation of Leaf Extract

The collected Themeda triandra leaves were thoroughly washed with distilled water to remove any adhering dirt or debris. The leaves were then air-dried at room temperature to retain their phytochemical integrity. Once dried, they were finely ground into a powder using a mechanical grinder. For extraction, the powdered plant material was subjected to ethanol extraction using a Soxhlet extractor. Ethanol was selected as the solvent due to its effectiveness in extracting a broad spectrum of phytochemicals. The extraction process was conducted to maximize the yield of bioactive compounds. The obtained ethanol extract was filtered, and the solvent was evaporated under reduced pressure using a rotary evaporator to obtain a concentrated extract for further phytochemical screening and GC-MS analysis.

GC-MS Analysis

In this study, Gas Chromatography-Mass Spectrometry (GC-MS) was utilized as the analytical tool to characterize the phytochemical compounds present in the Themeda triandra (Forssk.) leaf ethanol extract. Before analysis, the extract was dissolved in an appropriate solvent, typically methanol, to achieve an optimal concentration suitable for GC-MS analysis. A GC-MS instrument with specific configurations, including column type, temperature program, and detector settings, was carefully selected to ensure efficient separation and detection of compounds in the extract. Chromatographic separation parameters were optimized to achieve clear resolution of individual phytochemicals. Mass spectra were obtained using electron ionization (EI) mode, and compound identification was performed by comparing retention times and mass spectra with those available in the NIST Mass Spectral Library. This systematic approach ensured precise and reliable identification of the bioactive constituents present in the Themeda triandra leaf ethanol extract, providing valuable insights into its phytochemical composition.

RESULTS AND DISCUSSION

GC-MS Analysis of Themeda triandra (Forssk.) Leaf Extract

The phytochemical composition of Themeda triandra (Forssk.) leaf ethanol extract was analyzed using Gas Chromatography-Mass Spectrometry (GC-MS). The results revealed the

presence of 13 bioactive compounds, each with varying retention times (RT) and peak area percentages, indicating their relative abundance in the extract. The identified compounds, their molecular formulas, molecular weights, and relative percentages are summarized in Table 1.

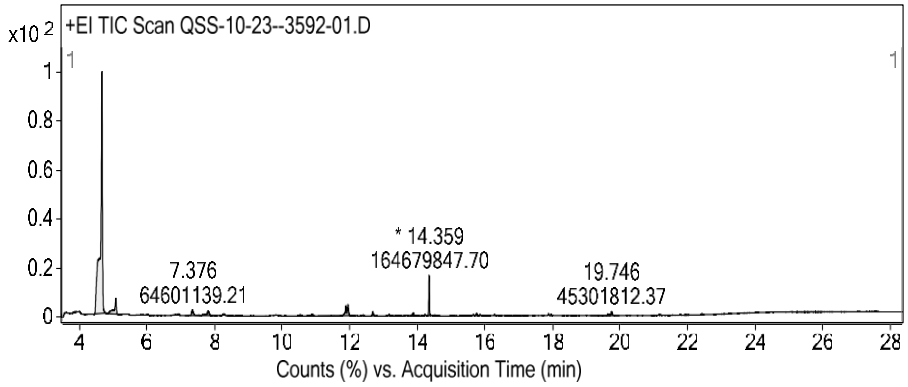


Figure. GC-MS Chromatogram of the Extract of *Themeda triandra (Forssk.) Leaf*

Table. GC-MS Analysis of Extract of Themeda triandra (Forssk.) Leaf

Peak	RT	Area %	Name of Compound	Molecular Weight	Molecular Formula
1	4.701	76.39	Silane, diethylmethyl	102	C6H16Si
2	5.108	5.44	2-Butenal, 2-ethenyl-	96	C6H8O
3	7.376	1.71	13-Heptadecyn-1-ol	252	C17H32O
4	7.828	2.05	Pregn-5-ene-3,11-dione, 17,20:20,21-bis[methylenebis(oxy)]-, cyclic 3-(1,2-ethanediyl acetal)	446	C27H40O4
5	10.564	0.24	4,13,20-Tri-O-methylphorbol 12-acetate	448	C27H38O7
6	10.918	0.59	N-[2-(Morpholin-4-yl) phenyl]- 5-nitrofuran-2-carboxamide, TMS	389	C17H19N3O5
7	11.903	1.98	Hexanoic acid, ethyl ester	144	C8H16O2
8	11.935	4.29	(-)-Methyl-3,3-dimethylcyclopropane-1, trans-2-dicarboxylate	186	C10H14O4
9	12.694	0.59	Aclarubicin	811	C40H50NO13
10	13.892	0.73	α-D-Glucofuranose, 6-O-(trimethylsilyl)-, cyclic1,2:3,5-bis (butylboronate	384	C17H34B2O6Si
11	14.359	4.36	3,3-Diethoxy-1-propanol, propylether	190	C10H22O3
12	15.765	0.43	Octadecane,3-ethyl-5-(2-ethy	366	C26H54
13	19.746	1.20	2,2,4-Trimethyl-1,3-pentanedi	286	C8H18O2

The GC-MS analysis detected a diverse range of bioactive compounds, including silanes, esters, alcohols, acids, steroids, and nitrogen-containing heterocyclic compounds. The presence of these compounds suggests the potential pharmacological and therapeutic significance of Themeda triandra leaf extract. The GC-MS analysis of Themeda triandra leaf ethanol extract demonstrated the presence of bioactive compounds that could contribute to the plant's medicinal value. The high abundance of Silane, Diethylmethyl suggests a protective role, potentially aiding in antimicrobial activity. The presence of steroids, esters, and alcohols indicates

the plant's potential as an anti-inflammatory and antioxidant agent. The detection of Aclarubicin, a known anticancer antibiotic, suggests that Themeda triandra may hold promise for pharmaceutical applications. Additionally, the presence of Hexanoic acid ethyl ester and other esters further supports the plant's antimicrobial and antioxidant potential. These findings provide a scientific basis for the traditional use of Themeda triandra in medicinal applications. Further studies, including in-vitro and in-vivo pharmacological evaluations, are necessary to validate these bioactive compounds' therapeutic effects and explore their potential applications in drug development.

CONCLUSION

The GC-MS analysis of Themeda triandra (Forssk.) leaf extract has successfully identified a diverse range of bioactive compounds, including silanes, esters, alcohols, steroids, and nitrogen-containing heterocyclic compounds. These compounds have been previously associated with various pharmacological activities such as antimicrobial, antioxidant, anti-inflammatory, and anticancer properties. The presence of significant compounds such as Silane, Diethylmethyl and Aclarubicin highlights the potential therapeutic applications of Themeda triandra in modern medicine. This study provides a comprehensive chemical profile of the leaf extract, laying the foundation for future investigations into its pharmacological efficacy. Further in-vitro and in-vivo studies are needed to confirm the therapeutic potential of these compounds and explore their use in the pharmaceutical and nutraceutical industries.

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