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Original Article

Chemical Composition and Nutritional Evaluation of *Themeda Triandra (Forssk.)* Inflorescence

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ABSTRACT

The present study investigates the GC-MS analysis and quantitative nutritional profiling of Themeda triandra (Forssk.) inflorescence to explore its bioactive compounds and nutritional significance. The GC-MS analysis identified 14 bioactive compounds, with Hexanoic acid, ethyl ester (33.98%), Butanoic acid, ethyl ester (17.33%), and 2-Myristynoyl pantetheine (11.77%) as the major constituents. These compounds belong to diverse chemical classes, including fatty acid esters, organic acids, and phenolic compounds, which are known for their antioxidant, antimicrobial, and pharmacological properties. The nutritional analysis revealed a high carbohydrate content (73.38 g/100g), crude fiber (27.82 g/100g), and protein (6.45 g/100g), making Themeda triandra a potential candidate for livestock feed and functional food applications. The energy value (333.72 Kcal/100g) suggests its significance as an energy-rich plant, while the presence of essential minerals like sodium (94.67 mg/kg) further supports its nutritional importance. The study highlights the phytochemical diversity and nutritional potential of Themeda triandra, advocating for its utilization in nutraceuticals, fodder, and medicinal applications.

Keywords: Chemical Composition, Nutritional Evaluation, Inflorescence

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 and plays a crucial role in natural ecosystems as well as in livestock nutrition. This grass species has been traditionally recognized for its ecological significance, resilience to harsh environmental conditions, and potential medicinal properties. Despite its widespread occurrence and utilization, the detailed phytochemical and nutritional composition of its inflorescence remains largely unexplored. The analysis of plant bioactive compounds is essential for understanding their potential applications in health, agriculture, and pharmaceutical industries. Gas Chromatography-Mass Spectrometry (GC-MS) is a powerful analytical tool widely used to identify and quantify complex chemical constituents in plant extracts. This technique provides insights into the presence of bioactive compounds, including flavonoids, alkaloids, terpenes, and fatty acids, which may contribute to the medicinal and nutritional value of Themeda triandra.

In addition to phytochemical profiling, the nutritional composition of Themeda triandra inflorescence is of significant interest. Nutritional analysis provides vital information on macronutrients and micronutrients, which can enhance its potential as a valuable fodder resource. The presence of essential minerals, proteins, and fiber in grass species contributes to their role in animal feed and human health benefits. Although several studies have explored the ecological and agronomic aspects of Themeda triandra, limited research has focused on the combined GC-MS profiling and nutritional evaluation of its inflorescence. Therefore, this study aims to bridge this gap by conducting a comprehensive analysis of the phytochemical constituents and nutritional profile of Themeda triandra inflorescence. The findings of this study may provide a scientific basis for its potential applications in food, medicine, and sustainable agriculture.

MATERIALS AND METHODS

Preparation of Inflorescence Extract

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Themeda triandra (Forssk.) inflorescences were collected from their natural habitat in Borgaon, District Amravati, Maharashtra, India. The collected inflorescences were carefully selected to ensure they were mature, healthy, and free from contaminants.

Processing of Inflorescence Material

The collected inflorescences were washed thoroughly with distilled water to remove any dust, dirt, or other impurities. After washing, the inflorescences were shade-dried at room temperature for several days until a constant weight was achieved. This process helped in preserving the bioactive compounds while preventing any degradation due to excessive heat.

RESULTS AND DISCUSSION

GC-MS Analysis of Themeda triandra (Forssk.) Inflorescence Extract. The Gas Chromatography-Mass Spectrometry (GC-MS) analysis of Themeda triandra (Forssk.) inflorescence ethanol extract identified 14 bioactive compounds, indicating the plant's diverse phytochemical composition. These compounds belong to different classes, including esters, fatty acids, phenols, and nitrogen-containing organic compounds, contributing to their potential pharmacological and nutritional significance.

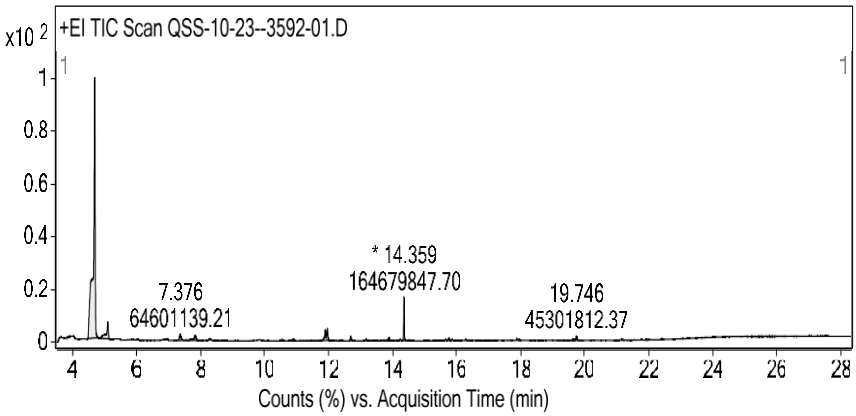


Figure. GC-MS Chromatogram of the Inflorescence Extract of *Themeda triandra (Forssk.) Inflorescence*

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

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

Among the detected compounds, Hexanoic acid, ethyl ester (33.98%) was the most abundant, followed by Butanoic acid, ethyl ester (17.33%), 2-Myristynoyl pantetheine (11.77%), and Pentanoic acid, ethyl ester (11.17%). The presence of fatty acid esters such as Hexanoic acid, ethyl ester and Octadecanoic acid, ethyl ester suggests the plant's potential in antioxidant, antimicrobial, and anti-inflammatory applications. These compounds have been reported to contribute to plant defense mechanisms and have pharmaceutical importance. Other detected compounds, such as Phenol, 2,5-bis(1,1-dimethylethyl)- and Adenosine, N-(2,3-dihydroxy-3-methylbutyl)-, may contribute to antioxidant properties, enhancing the therapeutic value of the plant. The presence of Dodecane and Octadecane suggests a role in hydrophobic interactions and lipid metabolism. The identification of N-(2,4-Dichlorophenyl)-3-oxobutanamide, 2TMS (isomer 2) and 2,7-Diphenyl-1,6 dioxopyridazino[4,5:2',3']pyrrolo[4',5'-d]pyridazine suggests potential bioactive roles in pharmacological applications. These findings highlight the diverse functional properties of Themeda triandra inflorescence extract and support its possible use in nutraceuticals, cosmetics, and pharmaceuticals.

Quantitative Nutritional Analysis of Themeda triandra (Forssk.) Inflorescence

The quantitative nutritional analysis of Themeda triandra inflorescence revealed significant nutritional components, reinforcing its value as a potential fodder grass and medicinal plant.

- Energy Content: The energy value of 333.72 Kcal/100g suggests its potential as a valuable energy source, suitable for livestock nutrition.
- Carbohydrate Content: At 73.38 g/100g, carbohydrates constitute a major fraction of the plant, indicating its role in providing energy.
- Fat and Protein Content: The fat content (1.60%) and protein content (6.45 g/100g) demonstrate the plant's potential as a moderate nutritional source, contributing to essential fatty acid metabolism and growth support.
- Crude Fiber: A high crude fiber content of 27.82 g/100g signifies its importance in digestive health, particularly for livestock consumption. The fiber content is essential for maintaining gut health and improving nutrient absorption in ruminants.
- Ash Content: The ash content (10.09%) reflects the plant's mineral richness, confirming its contribution to essential micronutrients.
- Sodium Content: The sodium content (94.67 mg/kg) highlights its role in electrolyte balance, crucial for metabolic functions.

Table. Quantitative Nutritional Analysis of Themeda triandra (Forssk.) Inflorescence

S.No.	Parameters	Results	LOQ	UOM	Method
Chemical					
1	Energy	333.72	-	Kcal/100g	QSS/GUJ/VSH/LAB/SOP-020
2	Carbohydrates	73.38	-	g/100g	IS 1656 2022
3	Fat	1.60	-	%	QSS/GUJ/VSH/LAB/SOP-023
4	Protein	6.45	-	g/100g	IS 7219:1973
5	ReducingSugar	BLQ	0.5	%	IS6287:1985
6	Non-ReducingSugar	BLQ	0.5	%	IS6287:1985
7	SodiumasNa	94.67	-	mg/kg	QSS/GUJ/VSH/LAB/SOP-001
8	CrudeFibre	27.82	-	g/100g	ISO6865:2000
9	Ash	10.09	-	%	ISO5985:2002
10	Nitrogen	1.09	-	g/100g	IS7219:1973

Nitrogen Content: At 1.09 g/100g, nitrogen levels suggest moderate protein synthesis potential. Interestingly, reducing and non-reducing sugars were below the limit of quantification (BLQ), suggesting a low simple sugar content. This is advantageous for

applications where controlled sugar levels are required, particularly in dietary management.

CONCLUSION

The GC-MS analysis and quantitative nutritional evaluation of Themeda triandra (Forssk.) inflorescence confirm its rich bioactive composition and significant nutritional value. The identification of various fatty acid esters, phenolic compounds, and organic acids supports its potential pharmacological applications, while the high carbohydrate and crude fiber content highlights its nutritional importance for livestock and functional food development. The study establishes Themeda triandra as a valuable plant species with applications in medicinal, agricultural, and food industries. Further research on its antioxidant, antimicrobial, and pharmacological properties could enhance its commercial viability and potential therapeutic uses

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