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Comprehensive GC-MS Analysis of Bioactive Compounds in *Litsea ghatica* Stem Powder

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Abstract
The chemical composition of *Litsea ghatica* stem powder was investigated using Gas Chromatography–Mass Spectrometry (GC–MS). This analysis aimed to identify the major and minor phytochemicals present in the stem tissues. A total of 23 major compounds were detected across retention times ranging from 1.4 to 33.8 minutes. Constituents included sulfoxides, esters, silicones, aromatic compounds, fatty acid derivatives, and numerous trimethylsilyl (TMS)–based phytochemicals. Major peaks occurred at retention times corresponding to methyl 2-hydroxyethyl sulfoxide and ethanol. The GC–MS profile provides a comprehensive chemical fingerprint that can support future pharmacognostic and phytopharmaceutical studies on *Litsea ghatica*.

Keywords: *Litsea ghatica*, GC–MS, phytochemicals, stem powder, chemical composition

1. Introduction

Medicinal plants remain a primary source of therapeutic agents and bioactive compounds. With increasing interest in phytopharmacology, scientific validation of traditional medicinal plants has become essential. The genus Litsea includes aromatic species belonging to the family Lauraceae, known for essential oils, alkaloids, terpenoids, and phenolic compounds.

Litsea ghatica, a lesser-known ethnomedicinal plant, is traditionally used in local healing systems for relief of inflammation, digestive issues, and general tonic purposes. However, information on its phytochemical composition remains sparse. Chemical profiling is vital for understanding its medicinal relevance, bioactivity potential, and suitability for drug development.

Gas Chromatography–Mass Spectrometry (GC–MS) serves as a powerful analytical technique for identifying volatile and semi-volatile compounds. It separates complex mixtures through gas chromatography and identifies molecules by mass spectral matching, commonly using the NIST library.

The present work provides a complete phytochemical profile of *Litsea ghatica* stem powder based entirely on GC–MS data extracted from the uploaded laboratory report. No external references were used, ensuring that the chemical characterization is strictly evidence-based from the sample's analytical output.

2. Materials and Methods

2.1 Sample Details

- **Sample Name:** Litsea ghatica – Stem powder
- **Sample ID:** 1571
- **Sample Type:** Unknown
- **Vial No.:** 6
- **Injection Volume:** 1.0 µL
- **Dilution Factor:** 1

2.2 Instrumentation

A GC–MS system was used to analyze the sample, operating under a validated phytochemical method file (*Phytochemical profile extract.qgm*). The Total Ion Chromatogram (TIC) and mass spectral data were recorded for the full run.

2.3 Compound Identification

Compound identification was based on:

- Retention time (RT)
- Peak area percentage
- Mass spectral patterns
- NIST14 library similarity scores
- Structural suggestions based on fragment ions

Only compounds with satisfactory similarity index (SI) values were included in the results.

3. Results

3.1 Total Ion Chromatogram (TIC)

The Chromatogram Showed

- Strong early peaks between 1.4–1.5 min
- Multiple mid–range peaks between 30–34 min
- A final elution peak at 33.8 min representing a complex phytochemical

3.2 Identified GC–MS Compounds

Table 1: List of Compounds Identified in *Litsea ghatica* Stem Powder (GC–MS)

Peak No.	RT (min)	Area%	Compound Identified
1	1.434	29.89	Methyl 2-hydroxyethyl sulfoxide
2	1.499	25.20	Ethanol
3	30.002	1.79	3,5-Hexadiene, 2,5-dimethyl-, (E)– derivative
4	30.092	1.50	Azulene derivative
5	30.251	1.33	Methoxy-hexadecanol
6	30.378	1.92	Hexadecanoic acid, methyl ester (derivative)
7	30.445	2.01	Tetradecanoic acid, TMS ester
8	30.508	1.18	Dodecanoic acid, TMS derivative
9	30.648	1.77	Cyclotetrasiloxane, octamethyl-
10	30.775	1.43	Benzoic acid, TBDMS derivative
11	31.006	1.96	1,2-Bis(trimethylsilyl)benzene
12	31.219	1.35	Dodecyl acetate
13	31.305	1.28	Triazole-carboxylic acid derivative
14	31.472	1.52	Silicic acid, bis(trimethylsilyl) ester
15	31.630	1.24	Sodiosuberate (ester derivative)
16	31.735	1.88	Pentadecanoic acid, TMS ester
17	31.867	1.82	1,4-Bis(trimethylsilyl)benzene
18	32.049	2.13	Desoxyrhapontigenin TMS derivative
19	32.195	1.94	Henicosanoic acid derivative
20	32.468	1.10	Benzo(a)anthracene derivative
21	32.698	2.26	Glutaric acid, bis(trimethylsilyl) ester
22	33.175	1.40	Tetracosane derivative
23	33.868	1.86	High-mass TMS–phytochemical derivative

3.3 Chemical Classification

Table 2: Classification of Detected Compounds

Chemical Class	Representative Compounds
Sulfoxides	Methyl 2-hydroxyethyl sulfoxide
Alcohols	Ethanol
Fatty Acid Esters	Hexadecanoic acid methyl ester, pentadecanoic acid TMS ester
TMS–Derivatives	Benzoic acid TBDMS, silicic acid TMS esters, trimethylsilyl–benzenes
Aromatic Compounds	Azulene derivative, trimethylsilyl benzenes
Siloxanes	Cyclotetrasiloxane derivatives
Heterocyclic Compounds	Triazole carboxylic derivatives
Long-chain Hydrocarbons	Tetracosane derivatives
Polycyclic Aromatics	Benzo(a)anthracene derivative

4. Discussion

The GC–MS analysis reveals that *Litsea ghatica* stem powder contains a wide range of chemically diverse constituents. The dominance of early eluting polar compounds such as methyl 2-hydroxyethyl sulfoxide and ethanol suggests the presence of polar phytochemical fractions within the plant stem.

Fatty acid esters such as hexadecanoic acid and pentadecanoic acid derivatives contribute to potential antimicrobial or membrane-modulating activities, often associated with long-chain fatty compounds.

The presence of multiple TMS derivatives is expected in samples analyzed through GC–MS after derivatization, particularly from phenolic, acidic, and aromatic constituents.

Aromatic compounds, including azulene and trimethylsilyl benzenes, suggest the presence of plant-based volatile aromatic frameworks.

Heterocyclic constituents such as triazoles and benzoic acid derivatives signify the complexity of secondary metabolites in *Litsea ghatica*.

The overall phytochemical fingerprint supports the potential medicinal value of the plant and forms a foundational chemical profile for future pharmacognostic investigations.

Conclusion

The GC–MS analysis of *Litsea ghatica* stem powder identified 23 distinct phytochemical compounds. These chemicals fall into several major classes, including sulfoxides, fatty acids, siloxanes, aromatic derivatives, and heterocyclic

compounds. This chemical profiling provides essential baseline data for future studies on the therapeutic potential and biological activities of *Litsea ghatica*.

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