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Original article

GC-MS Analysis of *Hildegardia poplifolia* (Roxb.) Schott & Endl: An Endangered Potential Medicinal Plant

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ABSTRACT:

The present study was carried out to identify the phytochemicals present in the methanolic extract of *Hildegardia poplifolia* by GC-MS analysis to learn its usage by the traditional healers as 'a plant possessing medicinal properties'. Eighteen compounds were identified. The major constituents are 3, 7, 11, 15-Tetramethyl-2-hexadecen-1-ol (43.96%), Olean-12-ene (11.55%) n-Hexadecanoic acid (10.56%) and 4-Pyrimidinamine, 2, 6-dimethyl- (4.34%). Many of them are used in pharmacy for various uses like antioxidant, anti-diabetic, malaria, anti-inflammatory, anti-cancer and antimicrobial.

KEYWORDS: Gas-chromatography; Ailments; *Hildegardia poplifolia*; Phyto components.

Statement of Originality of work: The manuscript has been read and approved by all the authors, the requirements for authorship have been met, and that each author believes that the manuscript represents honest and original work.

INTRODUCTION

Hildegardia poplifolia, an endangered indigenous medium sized tree species, belongs to the family; Sterculiaceae is distributed in dry deciduous forests of Tamil Nadu and Andhra Pradesh. The plant extract is used to cure malaria and dog bite¹. Leaf and stem bark extracts are reported to have antimicrobial² antioxidant³ and antiinflammatory activities⁴. The fiber extracted from the bark is used for domestic purposes. It contained rich varieties of phytochemical constituents like alkaloids, flavonoids, phenols, tannins, terpenoids, steroids, etc⁵. Higher plants are a rich source of secondary metabolites with interesting biological activities. In general, these secondary metabolites are an important source with a variety of structural arrangements and properties. A knowledge of the

chemical constituents of plants is desirable not only for the discovery of therapeutic agents, but also because such information may be of great value in disclosing new sources of economic phytochemicals for the synthesis of complex chemical substances and for discovering the actual significance of folkloric remedies. Hence a thorough validation of the herbal drugs has emerged as a new branch of science emphasizing and prioritizing the standardization of the natural drugs and products because several of the phytochemicals have complementary and overlapping mechanism of action. Mass spectrometry, coupled with chromatographic separations such as Gas chromatography (GC/MS) is normally used for direct analysis of components

existing in traditional medicines and medicinal plants.

MATERIALS AND METHODS

COLLECTION OF PLANT MATERIAL

The leaves of *H. poplifolia* were collected from the Pachamalai, Eastern Ghats of Tamilnadu, South India. The hill is situated 2000 to 3000 feet above mean sea level and lies between 78.31' East and 11.28' North latitude. They were identified and authenticated by the Rabinat Herbarium, St. Joseph's College, Tiruchirappalli, Tamilnadu, India.

PREPARATION OF POWDER AND EXTRACT

Leaves of *H. poplifolia* (5g) was shade dried, powdered and extracted with methanol for 24 hours using cold maceration methods. The extract was then filtered through Whatman filter paper No.1 along with 2g sodium sulfate to remove the sediments and traces of water in the filtrate. Before filtering, the filter paper along with sodium sulphate is wetted with absolute alcohol. The filtrate is then concentrated by bubbling nitrogen gas into the solution and reduce the volume to 1ml. The extract contains both polar and non-polar phytochemicals.

GC-MS ANALYSIS

The GC-MS analysis of *H. poplifolia* powder leaves extract with in methanol, was performed using a Clarus 500 Perkin Elmer gas chromatography equipped with a Elite-5 capillary column (5% phenyl 95% dimethyl polysiloxane) (30nm X

0.25mm ID X 0.25µm df) and mass detector turbomass gold of the company which was operated in EI mode. Helium was the carriers gas at a flow rate of 1ml/min. and the injector was operated at 290°C and the oven temperature was programmed as follows; 50°C at 8°C/min to 200°C (5min) at 7°C/min to 290°C (10min).

IDENTIFICATION OF COMPONENTS

Interpretation on mass spectrum of GC-MS was done using the database of National Institute Standard and Technology (NIST), having more than 62,000 patterns. The mass spectrum of the unknown component was compared with the spectrum of the known components stored in the (NIST), library. The name, molecular weight and structure of the components of the test materials were ascertained⁶⁻⁷.

RESULTS AND DISCUSSION

The presence of phytochemicals in methanol extract of *H. poplifolia* is tabulated and represented by graphical method. Eighteen compounds were identified in *H. poplifolia* by GC-MS analysis. The prevailing compound was 3, 7, 11, 15-Tetramethyl-2-hexadecen-1-ol (43.96%), Olean-12-ene (11.55%) n-Hexadecanoic acid (10.56%) and 4-Pyrimidinamine, 2, 6-dimethyl- (4.34%). The chemical compounds shown in (Table 1) and the corresponding chemical shift peaks of the spectrum were shown in Fig 1.

Table 1. Components detected in the methanol extract of *Hildegardia populifolia*

S.No.	Peak Name	Retention time	Peak area	%Peak area
1.	Name: 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- Formula: C ₆ H ₈ O ₄ MW: 144	10.58	258107	1.7503
2.	Name: Benzofuran, 2,3-dihydro- Formula: C ₈ H ₈ O MW: 120	12.52	261234	1.7715
3.	Name: 2-Pyrrolidinone, 1-(4-methylphenyl)- Formula: C ₁₁ H ₁₃ NO MW: 175	12.66	136242	0.9239
4.	Name: 2-Methoxy-4-vinylphenol Formula: C ₉ H ₁₀ O ₂ MW: 150	13.88	310953	2.1087
5.	Name: 1,6-Cyclodecadiene, 1-methyl-5-methylene-8-(1-methylethyl)-, [s-(E,E)]- Formula: C ₁₅ H ₂₄	17.57	273377	1.8539

	MW: 204 Germacrene D			
6.	Name: Caryophyllene oxide Formula: C ₁₅ H ₂₄ O MW: 220	18.84	583005	3.9536
7.	Name: 16-Heptadecenal Formula: C ₁₇ H ₃₂ O MW: 252	18.96	313973	2.1292
8.	Name: 3-Cyclohexen-1-carboxaldehyde, 3,4-dimethyl- Formula: C ₉ H ₁₄ O MW: 138	19.30	367281	2.4907
9.	Name: Bicyclo[4.3.0]nonan-1-ol, 7,9-bis(methylene)-2,2,6-trimethyl- Formula: C ₁₄ H ₂₂ O MW: 206	20.09	344675	2.3374
10.	Name: Benzaldehyde, 3-(4-methoxyphenoxy)- Formula: C ₁₄ H ₁₂ O ₃ MW: 228	22.65	550711	3.7346
11.	Name: 2-Hexadecene, 3,7,11,15-tetramethyl-, [R*,R*-(E)]- Formula: C ₂₀ H ₄₀ MW: 280	22.75	52331	0.3549
12.	Name: 3,7,11,15-Tetramethyl-2-hexadecen-1-ol Formula: C ₂₀ H ₄₀ O MW: 296	22.91	6483334	43.9665
13.	Name: 2-Octenoic acid, 4-isopropylidene-7-methyl-6-methylene-, methyl ester Formula: C ₁₄ H ₂₂ O ₂ MW: 222	24.86	270803	1.8364
14.	Name: 1-Cyclohexene-1-propanal, 2,6,6-trimethyl- Formula: C ₁₂ H ₂₀ O MW: 180	24.98	131516	0.8919
15.	Name: n-Hexadecanoic acid Formula: C ₁₆ H ₃₂ O ₂ MW: 256	25.47	1558045	10.5658
16.	Name: 4-Pyrimidinamine, 2,6-dimethyl- Formula: C ₆ H ₉ N ₃ MW: 123	27.53	640341	4.3424
17.	Name: 5(2H)-Oxazolone, 4-(phenylmethyl)- Formula: C ₁₀ H ₉ NO ₂ MW: 175	29.93	506597	3.4355
18.	Name: Olean-12-ene Formula: C ₃₀ H ₅₀ MW: 410	36.84	1703568	11.5527

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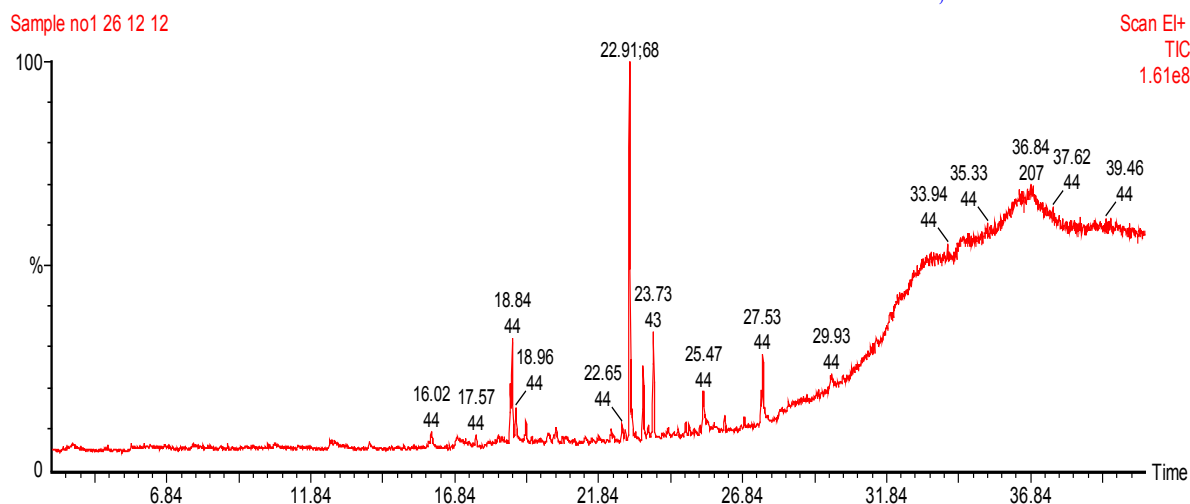


Figure 1. GC-MS chromatogram of the methanol extract of *Hildegardia populifolia*.

Phytol is one among the 18 compounds from the leaves of *H. populifolia*. Presence of Phytol in the leaves of *Kirganelia reticulata* aerial parts, which was also found to be effective in different stages of arthritis⁷. Abirami and Rajendran⁸ reported that this compound present in *Vernonia cinerea* added medicinal properties to this species despite the presence of eight other chemical compounds. Kale *et al.*⁹ also identified major fatty acid compounds in Sterculiaceae member, *Sterculia foetida* through GC-MS analysis.

Hexadenoic acid has earlier been reported as a component in alcohol extract of the leaves of *Kigelia pinnata*¹⁰ and *Melissa officinalis*¹¹. Parasuraman *et al.*¹² identified 17 compounds with n-Hexadecanoic acid and Octadecanoic acid as the major compounds in the leaves of *Cleistanthus collinus*. GC-MS analysis of ethyl acetate extract of *Goniothalamus umbrosus* revealed the presence of n-Hexadecanoic acid¹³. n-hexadecanoic acid, Hexadecanoic acid, Phytol, 9, 12-Octadecadienoic acid, 9, 12, 15-Octadecatrienoic acid and Squalene were identified in the ethanol leaf extract of *Aloe vera*¹⁴.

Terpenoids are an important compound of volatiles from plants. Most of them possess different allele chemical functions. *Carthamus lanatus* were identified two sesquiterpenes, α -bisabolol, caryophyllene oxide and α -Bisabolol fucopyranoside are main constituents analysed by gas chromatography and mass spectrum¹⁵. Balaji *et al.*¹⁶ reported that the GC-MS analysis of various extracts of *Clerodendrum phlomidis* leaves. Grover and Patni¹⁷ also reported that the GC-MS analyses

of methanolic extract of *Woodfordia fruticosa* twenty one compounds were identified.

In the present study, eighteen bioactive phytocompounds have been identified from methanol extract of the leaves of *Hildegardia populifolia* by GC-MS analysis. The presence of various bioactive compounds justifies the use of the leaf for various ailments by traditional practitioners. So it is recommended as a plant of phyto-pharmaceutical importance. However further studies will need to be undertaken to ascertain fully its bioactivity.

REFERENCES

1. Varaprasad B., Katikala PK., Naidu KC. and Penumajji S. Antifungal activity of selected plant extracts against pytopathogenic fungi *Aspergillus niger*. Ind. J. Sci. Tech. 2009; 2(4): 87-90.
2. Saradha M. and Paulsamy S. Antibacterial activity of leaf and stem bark extracts of the endangered tree species, *Hildegardia populifolia* (Roxb.) Schott and Endl. (Sterculiaceae). J. Res. Antimicrob., 2012; 1: 023-027.
3. Saradha M. and Paulsamy S. In vitro antioxidant activity and polyphenol estimation of methanolic extract of endangered medicinal tree species, *Hildegardia populifolia* (Roxb.) Schott & Endl. Int. J. Phytomed., 2012; 4: 362-368.
4. Saradha M. and Paulsamy S. Antinociceptive and antiinflammatory activities of stem bark of an endangered medicinal plant, *Hildegardia populifolia* (Roxb.) Schott and Endl. Int. J. Pharma Bio Sci., 2013; 4(3): 30-36.
5. Saradha, M., Paulsamy S. and Vinitha R. Antioxidant and antihemolytic activity of an endangered plant species, *Hildegardia populifolia* (roxb.) Schott & endl. Asian J. Pharm. Clin. Res., 2013; 6(5):135-137.

6. Nezhadali A., Nabavi M. and Akbarpour M. Chemical composition of ethanol/n-hexane extract of the leaf from *Tanacetum polycephalum* subsp. *duderanum* as a herbal plant in Iran. *Der Pharmacia Sinica*, 2010; 1 (3): 147-150.
7. Sathyaprabha G., Kumaravel S. and Panneerselvam A. Bioactive Compounds Identification of *Pleurotus platypus* and *Pleurotus eous* by GC-MS. *Adv. Appl. Sci. Res.*, 2011; 2: 51.
8. Abirami P and Rajendran A. GC-MS analysis of methanol extracts of *Vernonia cinerea*. *Eur. J. Exp. Biol.*, 2012; 2(1): 9-12.
9. Kale SS., Vijaya Darade, Thakur HA. Analysis of fixed oil from *Sterculia foetida* Linn. *Int. J. Pharm. Sci. Res.*, 2011; 2(11): 2908-2911.
10. Grace OM., Light ME., Lindsey KL., Moholland DA., Staden JV. and Jader AK. Antibacterial activity and isolation of antibacterial compounds from fruit of the traditional African medicinal plant, *Kigelia africana*. *S. Afr. J. Bot.*, 2002; 68: 220-222.
11. Sharafzadeh S., Morteza Khosh-Khui and Javidnia K. Aroma Profile of Leaf and Stem of Lemon Balm (*Melissa Officinalis* L.) Grown under Greenhouse Conditions. *Advan. Environmental Biol.*, 2011; 5(4): 547-550.
12. Parasuraman S., Raveendran R. and Madhavrao C. GC-MS analysis of leaf extracts of *Cleistanthus collinus* Roxb. (Euphorbiaceae). *Int. J. Ph. Sci.*, 2009; 1(2):284-286.
13. Siddiq Ibrahim A., Ahmad Bustamam A., Manal Mohammed E., Syam MI., Mohamed Yousif M., Abdelbasit Adam, Alhaj NA. and Rasedee Abdullah. GC-MS determination of bioactive components and antibacterial properties of *Goniothalamus umbrosus* extracts. *Afr. J. Biotech.*, 2009; 8(14): 3336-3340. 30.
14. Arunkumar S. and Muthuselvam M. Analysis of Phytochemical constituents and antimicrobial activities of Aloe vera L. against clinical pathogens. *World J. Agricultural Sci.*, 2009; 5(5): 572-576. 31.
15. Feliciano A., Medarde M., Del Rey B., Del Corral J. and Barrero A. Eudesmane glycosides from *Carthamus lanatus*. *Phytochem.*, 1990; 29: 3207-3211.
16. Balaj K., Kilimozhi D. and Parthasarathy V. GC-MS analysis of various extracts of *Clerodendrum phlomidis* leaf. *Int. J. Pharm. Pharm. Sci.*, 2014; 6 (1): 226-232.
17. Grover N. and Patni, V. Phytochemical characterization using various solvent extracts and GC-MS analysis of methanolic extract of *Woodfordia fruticosa* leaves. *Int. J. Pharm. Pharm. Sci.*, 2013; 5 (4): 291-295.

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