



Research Article

GC-MS ANALYSIS OF BIOACTIVE COMPOUNDS FROM THE ETHANOL EXTRACT OF LEAVES OF *NEIBUHRIA APETALA* DUNN.

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ABSTRACT

The present investigation was carried out to determine the possible bioactive components of *Neibuhria apetala* using GC-MS analysis. The phytoconstituents of the ethanol extract of leaves of *N. apetala* was investigated using Perkin- Elmer Gas Chromatography- Mass Spectrometry, while the mass spectra of the phytoconstituents found in the ethanol extract was matched with the National Institute of standard and Technology (NIST) library. Twenty three compounds were identified. The prevailing compounds in the *N. apetala* leaves ethanol extract were 3-Hexadecyne (26.09%), β -Sitosterol (23.57%), 9-Eicosyne (12.49%), 3,7,11,15-Tetramethyl-2-hexadecan-1-ol (8.74%), 7-Octadecyne, 2-methyl-(7.86%), Astaxanthin (3.50%), γ -Tocopherol (2.99%), 6,9,12,15-Docosa tetraenoic acid, methyl ester (2.63%), Gamolenic acid (2.39%) and 1 H-Pyrrole, 1-pentyl-(1.35%). The presence of various bioactive compounds confirms the application of *N. apetala* for various ailments. However, isolation of individual phytoconstituents may proceed to find a novel drug or lead compound.

Keywords: *Neibuhria apetala*, bioactive compounds, GC-MS analysis, ethanol leaf extract.

INTRODUCTION

Various medicinal properties have been attributed to natural herbs. Medicinal plants constitute the main source of new pharmaceuticals and healthcare products¹. The record of plants being used for medicinal purpose is perhaps as old as the history of mankind. The usage of medicinal plants in the industrialised societies has been traced for the extraction and enlargement of several drugs from these plants as well as from conventionally used folk medicine². Extraction and categorization of several active phytochemicals from these green factories have given birth to some high level action profile drugs³. In recent years, chemical analysis and biological assay have begun to play an important role in ethnobotanical studies⁴. In several cases, such analyses have led to the discovery of novel bioactive phytochemicals.

Standardization of plant materials is the need of the day. Several pharmacopoeia containing monographs of the plant materials exemplify only the physicochemical parameters. Hence the, modern methods recounting the identification and quantification of active constituents in the plant material may be useful for proper standardization of herbals and its formulations. Also the WHO has emphasized the need to ensure the quality of medicinal plants products using modern controlled techniques and applying suitable standards⁵⁻⁸. The combination of an ideal separation techniques (GC) with the best identification technique (MS) made GC-MS for qualitative and quantitative analysis of volatile and semi-volatile compounds.

Capparis species is also known as Caper plants. These are familiar as a potential cause of valuable nutrients and

biochemical compounds with physiological function. The multiple biological activities includes antibacterial, antifungal, hepatoprotective, anthelmintic, antidiabetic, anti-inflammatory, anti-cancer, and antihyperlipidemic. These activities as well as folk medicinal uses of Caper plants have been attributed to the presence of functional bioactives, such as phenolic acids, flavonoids, alkaloids, phytosterols, natural sugars, vitamins, and organic acids⁹. Taking into consideration of the medicinal importance of this plant, the ethanol extract of leaf of *Neibuhria apetala* Dunn. (Synonym: *Capparis apetala*) was analysed for the first time using GC-MS. Perusal of literature reveals that information on the GC-MS analysis of *Neibuhria apetala* is totally lacking. Hence, the objective of the present study is to identify the phytochemicals with the aid of GC-MS technique.

MATERIALS AND METHODS

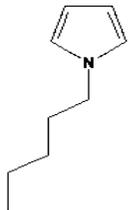
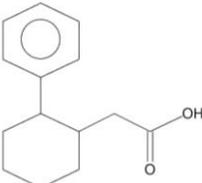
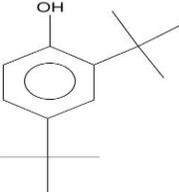
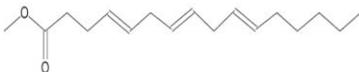
Collection of plant sample

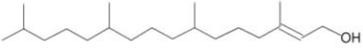
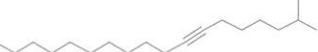
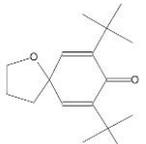
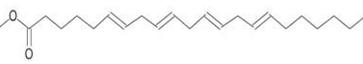
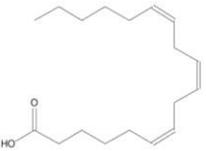
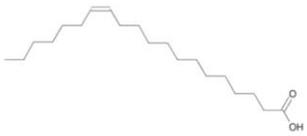
Leaves of *Neibuhria apetala* Dunn was collected from Petchiparai, Agasthiarmalai Biosphere Reserve, Western Ghats, Tamil Nadu. The plant was identified with the help of local flora and the same is authenticated in Botanical Survey of India, Southern circle, Coimbatore, Tamil Nadu. The voucher specimens were preserved in the Ethnopharmacology Unit, Research Department of Botany, V.O. Chidambaram College, Tuticorin, Tamil Nadu.

Preparation of plant extract

Leaves of *N. apetala* was cleaned, shade dried and crushed to powder in a mechanical grinder. Take a stopper flask and transfer the required quantity of weighed powder samples. Treat

Table 1. Phytochemicals detected in leaf of *N. apetala*

No.	RT	Name of the compound	Molecular Formulae	Molecular Weight	Peak Area %	Structure
1.	5.48	1H-Pyrrole, 1-pentyl-	CH ₁₅ N	137	1.35	
2.	7.81	2-Tridecenal, (E)-	C ₁₃ H ₂₄ O	196	0.38	
3.	8.62	Cyclohexaneacetic acid, 2-phenyl-	C ₁₄ H ₁₈ O ₂	218	0.61	
4.	9.48	Phenol, 2,4-bis(1,1-dimethylethyl)-	C ₁₄ H ₂₂ O	206	0.60	
5.	9.88	4,7,10-Hexadecatrienoic acid, methyl ester	C ₁₇ H ₂₈ O ₂	264	0.23	
6.	10.24	10-Methyl-8-tetradecen-1-ol acetate	C ₁₇ H ₃₂ O ₂	268	0.34	
7.	10.55	Z-(13,14-Epoxy)tetradec-11-en-1-ol acetate	C ₁₆ H ₂₈ O ₃	268	0.34	
8.	13.42	3-Hexadecyne	C ₁₆ H ₃₀	222	26.09	

9.	13.71	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	C ₂₀ H ₄₀ O	296	8.74	
10.	13.94	7-Octadecyne, 2-methyl-	C ₁₉ H ₃₆	264	7.86	
11.	14.32	7,9-Di-tert-butyl-1-oxaspiro(4,5)deca-6,9-diene-2,8-dione	C ₁₇ H ₂₄ O ₃	276	0.40	
12.	14.51	Hexadecanoic acid, methyl ester	C ₁₇ H ₃₄ O ₂	270	0.52	
13.	15.38	Hexadecanoic acid, ethyl ester	C ₁₈ H ₃₆ O ₂	284	1.13	
14.	16.84	8,11,14-Eicosatrienoic acid, (Z,Z,Z)-	C ₂₀ H ₃₄ O ₂	306	1.43	
15.	17.00	9-Eicosyne	C ₂₀ H ₃₈	278	12.49	
16.	17.78	6,9,12,15-Docosatetraenoic acid, methyl ester	C ₂₃ H ₃₈ O ₂	346	2.63	
17.	19.66	Oleic Acid	C ₁₈ H ₃₄ O ₂	282	0.81	
18.	22.26	Gamolenic Acid	C ₁₈ H ₃₀ O ₂	278	2.39	
19.	23.11	cis-13-Eicosenoic acid	C ₂₀ H ₃₈ O ₂	310	0.76	

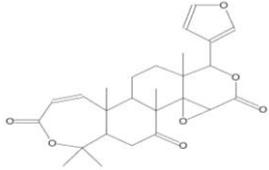
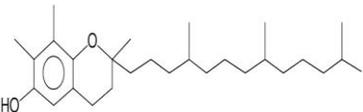
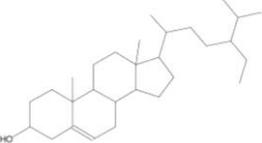
20.	24.79	Obacunone	C ₂₆ H ₃₀ O ₇	454	0.87	
21.	30.35	γ-Tocopherol	C ₂₈ H ₄₈ O ₂	416	2.99	
22.	30.93	Astaxanthin	C ₄₀ H ₅₂ O ₄	596	3.50	
23.	37.20	β-Sitosterol	C ₂₉ H ₅₀ O	414	23.57	

Table 2. Activity of phytochemicals identified in the ethanol extract of leaf of *N. apetala*

No.	RT	Name of the compound	Molecular Formulae	M W	Peak Area %	Compound Nature	**Activity
1.	5.48	1H-Pyrrole, 1-pentyl-	C ₉ H ₁₅ N	137	1.35	Alkaloid	Antimicrobial, Anti-inflammatory Antioxidant
2.	7.81	2-Tridecenal, (E)-	C ₁₃ H ₂₄ O	196	0.38	Aldehyde compound	Antimicrobial, Anti-inflammatory
3.	8.62	Cyclohexaneacetic acid, 2-phenyl-	C ₁₄ H ₁₈ O ₂	218	0.61	Acetic acid compound	Antimicrobial
4.	9.48	Phenol, 2,4-bis(1,1-dimethylethyl)-	C ₁₄ H ₂₂ O	206	0.60	Phenolic compound	Antimicrobial, Anti-inflammatory Antioxidant, Analgesic
5.	9.88	4,7,10-Hexadecatrienoic acid, methyl ester	C ₁₇ H ₂₈ O ₂	264	0.23	Unsaturated fatty acid ester	Cardio protective
6.	13.71	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	C ₂₀ H ₄₀ O	296	8.74	Alcoholic compound	Antimicrobial
7.	14.51	Hexadecanoic acid, methyl ester	C ₁₇ H ₃₄ O ₂	270	0.52	Palmitic acid methyl ester	Antioxidant, Hypocholesterolemic Nematicide, Pesticide Lubricant, Antiandrogenic Flavor, Hemolytic
8.	15.38	Hexadecanoic acid, ethyl ester	C ₁₈ H ₃₆ O ₂	284	1.13	Palmitic acid ethyl ester	Antioxidant, Hypocholesterolemic Nematicide, Pesticide Lubricant, Antiandrogenic

							Flavor, Hemolytic
9.	16.84	8,11,14-Eicosatrienoic acid, (Z,Z,Z)-	C ₂₀ H ₃₄ O ₂	306	1.43	Unsaturated fatty acid compound	Cardio protective
10.	17.78	6,9,12,15-Docosatetraenoic acid, methyl ester	C ₂₃ H ₃₈ O ₂	346	2.63	Unsaturated fatty acid ester compound	Cardio protective
11.	19.66	Oleic Acid	C ₁₈ H ₃₄ O ₂	282	0.81	Mon-unsaturated Fatty acid	Cancer preventive Flavor, Hypocholesterolemic 5-Alpha reductase inhibitor Antiandrogenic, Perfumery Insectifuge, Anti-inflammatory Anemiagenic, Dermatitigenic Choleretic
12.	22.26	Gamolenic Acid	C ₁₈ H ₃₀ O ₂	278	2.39	Acidic compound	Acidifier agent
13.	24.79	Obacunone	C ₂₆ H ₃₀ O ₇	454	0.87	Ketone compound	Anticancer, Cytotoxic Anti-inflammatory
14.	30.35	γ-Tocopherol	C ₂₈ H ₄₈ O ₂	416	2.99	Vitamin E	Antiageing, Analgesic, Antidiabetic, Anti-inflammatory, Antioxidant, Antidermatitic, Antileukemic, Antitumor, Anticancer, Hepatoprotective, Hypocholesterolemic Antiulcerogenic, Vasodilator, Antispasmodic, Antibronchitic, Anticoronary
15.	30.93	Astaxanthin	C ₄₀ H ₅₂ O ₄	596	3.50	Red pigment	Antioxidant
16.	37.20	β-Sitosterol	C ₂₉ H ₅₀ O	414	23.57	Steroid	Antimicrobial Anti-inflammatory Anticancer, Antiasthma Hepatoprotective Diuretic

**Source: Dr.Duke's Phytochemical and Ethnobotanical Databases

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