

GC – MS profiles of *Grewia emarginata* Wight & Arn

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Abstract

The present study was carried out to determine the possible phyto-compounds of *Grewia emarginata* (Tiliaceae) using GC-MS analysis. Sixteen compounds were detected from the present investigation. The prevailing compounds in the methanol extract of *Grewia emarginata* were 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- (14.76%), 3,7,11,15-Tetramethyl-2-hexadecen-1-ol (10.80%), Alpha-monopropionin (9.83%), Sucrose (8.52%), All-trans-Squalene (8.38%), n-Hexadecanoic acid (7.64%), Oxazole, 5-hexyl-2,4-dimethyl- (6.10%), N-Methoxy-N-methylacetamide (5.47%) and 2-Methyl-1-methylmannopyranoside (5.30%). The presence of some of these phyto-compounds corresponds to varied medicinal properties that can be exploited for the treatment of various diseases.

Keywords: Phyto-compounds, GC-MS, *Grewia emarginata*, Pharmacological properties.

Introduction

Medicinal plants as sources of bioactive compounds continue to play a central role in the maintenance of human health. Reports available on green plants represent a reservoir of effective chemotherapeutants, these are non-phytotoxic, more systemic and easily biodegradable [1,2]. According to the World Health Organization (WHO) in 2008, more than 80% of the world's population relies on traditional medicine for their primary health care needs [3]. The medicinal value of these plants lies in some chemical substances that produce a definite physiological action on the human body. 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 [4]. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids, and phenolic compounds. The determination of phyto constituents is largely performed by relatively expensive and often laborious techniques such as gas (GC) and liquid (LC) chromatography combined with specific detection schemes [5]. Analysis of small amounts of chemicals has become easier and more cost-effective owing to the development of hyphenated chromatographic techniques such as GC or LC-MS. GC-MS analysis can identify pure compounds present at less than 1gm. However, simple, cost-effective and rapid tests for detecting phyto components are necessary. *Grewia emarginata* is a small trees; branchlets tomentose. Leaves alternate, to 6 x 4.5 cm, ovate-elliptic, obtusely acute, base rounded, finely serrate, scabrous above, spreading tomentose below, basally 3 nerved; petiole 1 cm, pubescent. Cymes axillary or leaf opposed; peduncles 1, to 3 cm, pubescent; flowers many on the peduncles, white; pedicels 1 cm; bracts 10 x 2 mm, lanceolate; sepals 9 x 2 mm, lanceolate, pubescent; petals 6 x 3 mm, lanceolate, glandular at base; filaments to 8 mm; torus to 3 mm, hairy; ovary 3 mm, hairy, style 10 mm, stigma capitate, laciniate. Fruit slightly 4- lobed,

8 mm across, with long hairs. The plant is used to treat antidiuretic and some other diseases. Hence the present study was carried out to determine the possible phyto-compounds from *Grewia emarginata* were analyzed for the first time using GC-MS. The present study will help to isolate the compounds of medicinal value.

Materials and methods

Collection of samples

The leaves of *Grewia emarginata* 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 Dr. V.Nandagopalan, Dean of Science, National College, Tiruchirappalli, Tamilnadu, India.

Extract Preparation

Leaves of *Grewia emarginata* (5 g) was shade dried, powdered and extracted with methanol for 24 hours using cold maceration. The extract was then filtered through Whatman filter paper No. 1 along with 2 g 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 phyto components.

GC-MS Analysis

The GC-MS analysis of *Grewia emarginata* 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) (30 nm X 0.25 mm ID X 0.25 μ mdf) 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 (5 min) at 7 °C/min to 290 °C (10 min).

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 ascertained [6, 7].

Results and Discussion

The components present in the methanol extract of *G. emarginata* were identified by GC-MS analysis (Figure 1). The active compounds with their retention time (RT), Molecular formula and Molecular weight (MW) in the ethanol extract of rhizomes of *G. emarginata* are presented in Table 1. Sixteen compounds were identified in methanol extract of *G. emarginata*. The prevailing compounds in the methanol extract of *Grewia emarginata* were 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- (14.76%), 3,7,11,15-Tetramethyl-2-hexadecen-1-ol (10.80%) (synonym: phytol), Alpha-monopropionin (9.83%), Sucrose (8.52%), All-trans-Squalene (8.38%), n-Hexadecanoic acid (7.64%), Oxazole, 5-hexyl-2,4-dimethyl- (6.10%), N-Methoxy-N-methylacetamide (5.47%) and 2-Methyl-1-methylmannopyranoside (5.30%). Among those, 4H-Pyran-4one, 2, 3-dihydro-3,5 dihydroxy-6-methyl

was found to be a bio active compound. The literature of this compound showed that it is a flavonoid compound and also has various medical applications the activities like antimicrobial, antioxidant anticancer, hypercholesterolemic, antiulcerogenic, lubricant, nematocide, anti inflammatory, antiandrogenic and other activities.

Phytol is a key acyclic diterpene alcohol that is a precursor for vitamins E and K1. It is used along with simple sugar or corn syrup as a hardener in candies. Phytol was observed to have antibacterial activities against *Staphylococcus aureus* by causing damage to cell membranes as a result there is a leakage of potassium ions from bacterial cells [8]. Phytol, Phenol, 2, 4-bis (1-phenylethyl) - which are all have medicinal properties. The presence of phytol compounds attributes to the antimicrobial, anti-inflammatory and anticancer property of the plant leaves. On the other hand, the n-Hexadecanoic acid has antioxidant, hypocholesterolemic, nematocide, pesticide, lubricant, antiandrogenic, flavor, hemolytic 5- α reductase inhibitor activities.

In the present investigation, sixteen compounds were detected by Gas Chromatography-Mass Spectrum (GC-MS) analysis. The presence of various phyto-compounds justifies the use of this plant for various ailments by traditional practioners. However, isolation of individual active constituents and subjecting it to biological activity will definitely give successful results. It could be concluded that, *Grewia emarginata* contains various bioactive compound. So it is recommended as a plant of phytopharmaceutical importance.

Table 1: Phytocompounds identified in methanol extract of *Grewia emarginata* using GC-MS

S. No.	Peak Name	Retention time	Peak area	%Peak area
1.	<u>Name:</u> N-Methoxy-N-methylacetamide <u>Formula:</u> C4H9NO2 <u>MW:</u> 103	2.80	373487	5.4734
2.	<u>Name:</u> 3-Amino-2-oxazolidinone <u>Formula:</u> C3H6N2O2 <u>MW:</u> 102	3.47	290354	4.2551
3.	<u>Name:</u> 2-Methyl-1-methylmannopyranoside <u>Formula:</u> C7H14O5 <u>MW:</u> 178	5.15	362191	5.3079
4.	<u>Name:</u> 3-Hexene <u>Formula:</u> C6H12 <u>MW:</u> 84	5.69	247274	3.6238
5.	<u>Name:</u> 2-Cyclopenten-1-one, 2-hydroxy- <u>Formula:</u> C5H6O2 <u>MW:</u> 98	5.86	317408	4.6516
6.	<u>Name:</u> Alpha-monopropionin <u>Formula:</u> C6H12O4 <u>MW:</u> 148	7.62	671331	9.8383
7.	<u>Name:</u> 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- <u>Formula:</u> C6H8O4 <u>MW:</u> 144	10.54	1007464	14.7643
8.	<u>Name:</u> Propanamide, 2-amino-3-phenyl <u>Formula:</u> C9H12N2O <u>MW:</u> 164	12.51	337832	4.9509
9.	<u>Name:</u> 2-Methoxy-4-vinylphenol <u>Formula:</u> C9H10O2 <u>MW:</u> 150	13.85	143809	2.1075
10.	<u>Name:</u> Sucrose <u>Formula:</u> C12H22O11 <u>MW:</u> 342	16.95	581908	8.5278
11.	<u>Name:</u> Oxazole, 5-hexyl-2,4-dimethyl- <u>Formula:</u> C11H19NO	22.14	416408	6.1024

	<u>MW:</u> 181			
12.	<u>Name:</u> 3,7,11,15-Tetramethyl-2-hexadecen-1-ol <u>Formula:</u> C ₂₀ H ₄₀ O <u>MW:</u> 296	22.96	736961	10.8001
13.	<u>Name:</u> 6-Nonen-1-ol, acetate, (Z)- <u>Formula:</u> C ₁₁ H ₂₀ O ₂ <u>MW:</u> 184	23.55	108586	1.5913
14.	<u>Name:</u> n-Hexadecanoic acid <u>Formula:</u> C ₁₆ H ₃₂ O ₂ <u>MW:</u> 256	26.48	521978	7.6496
15.	<u>Name:</u> (Z)6,(Z)9-Pentadecadien-1-ol <u>Formula:</u> C ₁₅ H ₂₈ O <u>MW:</u> 224	29.96	134499	1.9711
16.	All-trans-Squalene <u>Formula:</u> C ₃₀ H ₅₀ <u>MW:</u> 410	40.06	572146	8.3848

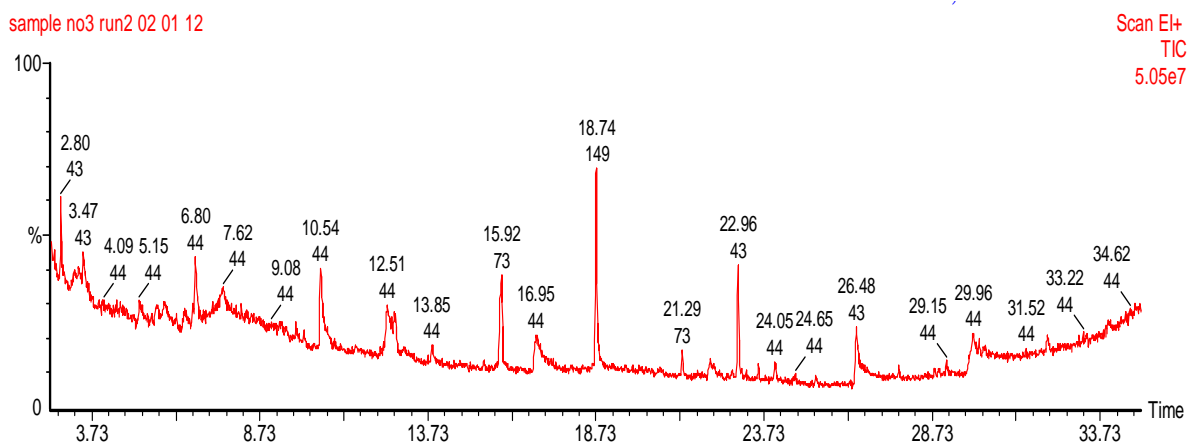


Fig 1: Gas chromatography and mass spectroscopy (GC-MS) analysis of methanol sample of *Grewia emarginata* Wight & Arn

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