



Identification and properties of *Asteracantha longifolia* (L.) Nees by GC-MS analysis

A.Doss, M.S.Rukshana and T.P.Kumari Pushpa Rani

Department of Microbiology, Kamaraj College, Tuticorin, Tamilnadu, India

*Corresponding author: M.S.Rukshana, Email: rukshanasana94@gmail.com

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ABSTRACT:

Plants have been an important source of medicine with qualities for thousands of years. Mainly on traditional remedies such as herbs for their history it has been used as a popular folk medicine. *Asteracantha longifolia* has medicinal values. Methanol leaf extract of this plant was analyzed using Gas Chromatography–Mass Spectrometry, while the mass spectra of the compounds found in the extract was matched with the National Institute of Standards and Technology (NIST) library. Gas chromatography mass spectrometry (GC-MS) analysis revealed the presence of 56 compounds. In GC-MS analysis, some of the phytocomponents screened were 2-propanone, Methylhydrazone, Acetaldehyde, Dimethylhydrazone, Cyclopentane etc. The compounds were identified by comparing their retention time and peak area with that of literature and by interpretation of mass spectra. Many of them are used in industry for various applications like flavor, antioxidant, anti-inflammatory, antimicrobial, pesticide and cancer preventive.

Keyword: Medicinal plants, Phytocompounds, GC-MS, Pharmacological applications.

INTRODUCTION

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 phytocompounds for the synthesis of complex chemical substances and for discovering the actual significance of folkloric remedies. Medicinal plants have been used by human being since ages in traditional medicine due to their therapeutic potential and the search on medicinal plants have led to the discovery of novel drug candidates used against diverse diseases. According to the World Health Organization (WHO) in 2008, more than 80% of the world's population relies on traditional medicine for their primary healthcare needs [7]. Plants have great potential uses, especially as traditional medicine and pharmacopoeial drugs. Medicinal plants have provided the modern medicine with numerous plant-derived therapeutic agents. Many plants contain a variety of phytopharmaceuticals, which have found very important applications in the fields of agriculture, human and veterinary medicine. The most important bioactive constituents of the plants are alkaloids, tannins, flavonoids and phenolic compounds. Phytochemical is a natural bioactive compound found in plants such as vegetables, fruits, medicinal plants, flowers, leaves and root that work with and fibers to act as a defense system against diseases of more accurately, to protect against diseases [4]. 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.

Morphological Description

Asteracantha longifolia (Family: Acanthaceae) commonly known as Hygrophila (Synonym: *Hygrophilia auriculata*). A smooth, widely spreading vine, with the stems trailing on mud or floating on water. Leaves are oblong-ovate 7-14 cm long, with a pointed tip and heart- or arrow-shaped base, long petioled, the margins entire or angular,

and sublobed. The peduncles are erect, 2.5 to 5 cm long, with 1 or 2 flowers in the axils of the leaves. Sepals are green, oblong, about 8 mm. The corolla is narrowly bell-shaped, about 5 mm long, and purplish with the tube deeper purple inside. It is a robust, erect, annual herb. The stems are sub-quadrangular with thickened nodes; the leaves are oblanceolate, with a yellow spine in its axil; the flowers pale, purple blue, densely clustered in axils; the fruits are oblong, glabrous capsules, 4-8 seeded.

MATERIALS AND METHODS

Plant materials

Fresh plant leaves were collected randomly from the gardens and villages of Trichy district, Tamilnadu from the natural stands. The botanical identity of these plants was confirmed by Dr.V.Sampath Kumar, Scientist – C, Botanical Survey of India (Southern Circle), Coimbatore, Tamilnadu. The voucher specimens are deposited at the Department of Botany, National College (Autonomous), Tiruchirapalli-620001, Tamilnadu, India.

Preparation extract

Leaves of *A.longifolia* (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 sulfate 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 phytocomponents.

GC-MS Analysis

The GC-MS analysis of *A. longifolia* 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). The GC-MS study was carried out at CVR Labs, Chennai.

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 [3,8].

RESULTS

GC-MS is one of the best techniques to identify the constituents of volatile matter, long chain, branched chain hydrocarbons, alcohols acids, esters etc. The GC-MS analysis of *A. longifolia*

leaves revealed the presence of more than 56 components (phytochemical constituents) that could contribute the medicinal quality of the plant. The identification of the phytochemical compounds was confirmed based on the peak area, retention time and molecular formula. The active principles with their Retention time (RT), Quality and peak area in percentage in the methanolic extract of the leaf of *Asteracantha longifolia* presented in Table 1. The first compound identified with less retention time (6.51 min) was 2-(3H)-Furanone, dihydro-3-hydroxy-2-butene,1-butoxy-3-methyl-2(3H)-Furanone,dihydro-3-hydroxy whereas Octadecane was the last compound which took longest retention time (35.39 min) to identify (supplementary Figure 1). The phytochemicals identified through GC-MS analysis showed many biological activities relevant to this study are listed in Table 1. The graph provided also shows the peak range and the retention time.

Table. 1 Major components of *A.longifolia*

S.NO.	RT	Peak area	Name of the compound	Compound nature	Activity
01	7.98	38.02	2-propanone	Organic compound	Used as a solvent by the pharmaceutical industry and in acne treatments
02			Methylhydrazone	Organic compound	Used in medical biotechnology(i.e) Antibodies against certain types of cancer
03			Acetaldehyde	Organic compound	Used in pharmaceutical and cosmetic industries.
05	9.16	33.55	Cyclopentane	-	-
06	7.28	12.66	Ethanol, 4-Pentanol	-	-
07	7.70	10.91	1- Propene	-	-
08	10.26	1.96	2-Butanol	-	-

DISCUSSION

The more precise information in qualitative analysis can be obtained by gas-chromatography coupled with mass spectrometry (GC-MS) [14]. For quantitative determination, gas-chromatography with flame ionization detector (GC-FID) and GC-MS are preferred [6,9,13].

The GC-MS analysis of *A. longifolia* leaves revealed the presence of fifty-six compounds. The identified compounds possess many biological properties. The identified compounds are alkaloids, tannins, Steroids, Phenolic compounds, Tannins, Phytol, Flavonoids, Carbohydrate & Glycosides, Protein & Amino acids. Alkaloids have been well investigated for many pharmacological properties including Antiprotozoal, cytotoxic, antidiabetic [11] and anti-inflammatory [12] properties, but there are only few reports about their antimicrobial properties. Plants with alkaloids in the present study are *Asteracantha longifolia* is used to cure asthma. Plant steroids are known to be important for their cardiotoxic activities, possession of insecticidal, anti-inflammatory [1], analgesic properties [10], central nervous system [2] activities and antimicrobial properties. They are also used in nutrition, herbal medicine and cosmetics. Tannins were reported to exhibit anti-diabetic [12], anti-inflammatory, antibacterial and antitumor activities. It has also been reported that certain tannins were able to inhibit HIV replication selectively besides use as diuretics. Plant tannins have been widely recognized for their pharmacological properties and are known to make trees and shrubs a different meal for many

caterpillars [5]. Glycosides were reported to exhibit anti-diabetic [12S], characteristics. The anti-inflammatory, antispasmodic, anti-analgesic and anti-diuretic can be attributed to their high steroids, tannins, terpenoids and saponins.

Therefore, GC-MS method is a direct and fast analytical approach for identification of terpenoids and steroids and only few grams of plant material is required. The importance of the study is due to the biological activity of some of these compounds. The present study, which reveals the presence of components in *Asteracantha longifolia* suggest that the contribution of these compounds on the pharmacological activity should be evaluated.

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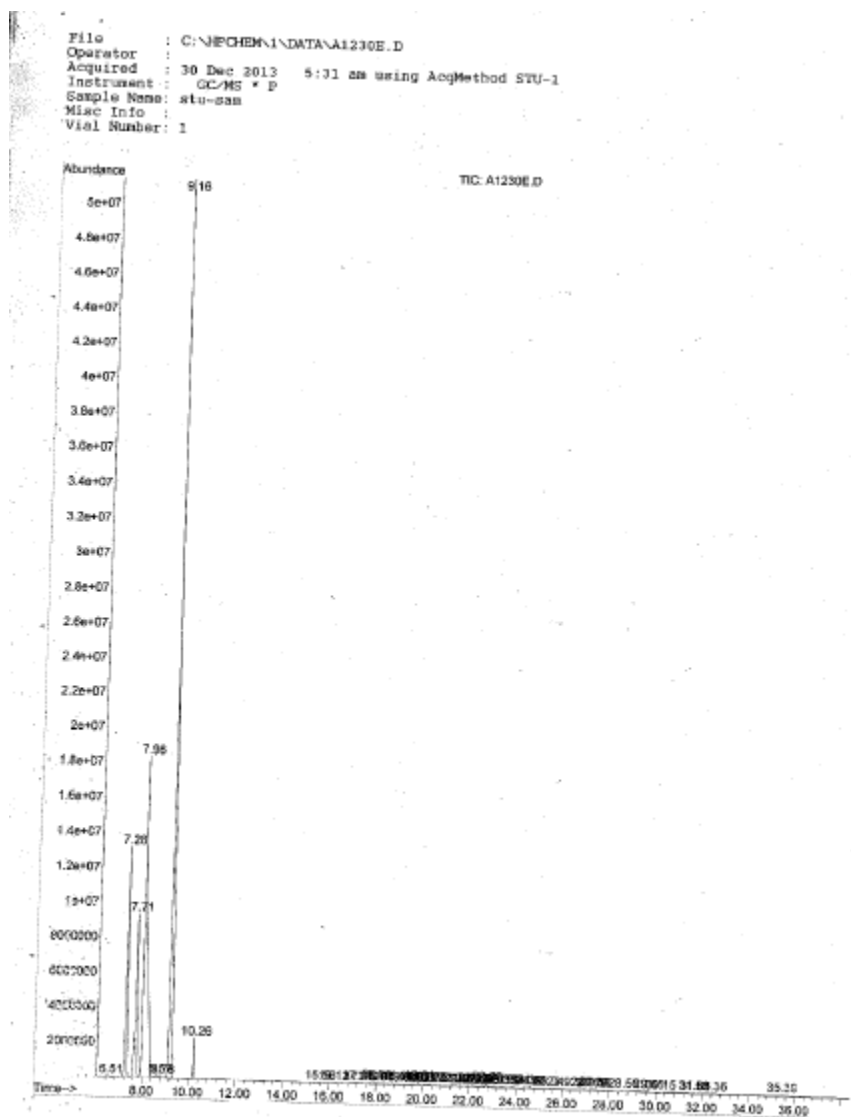
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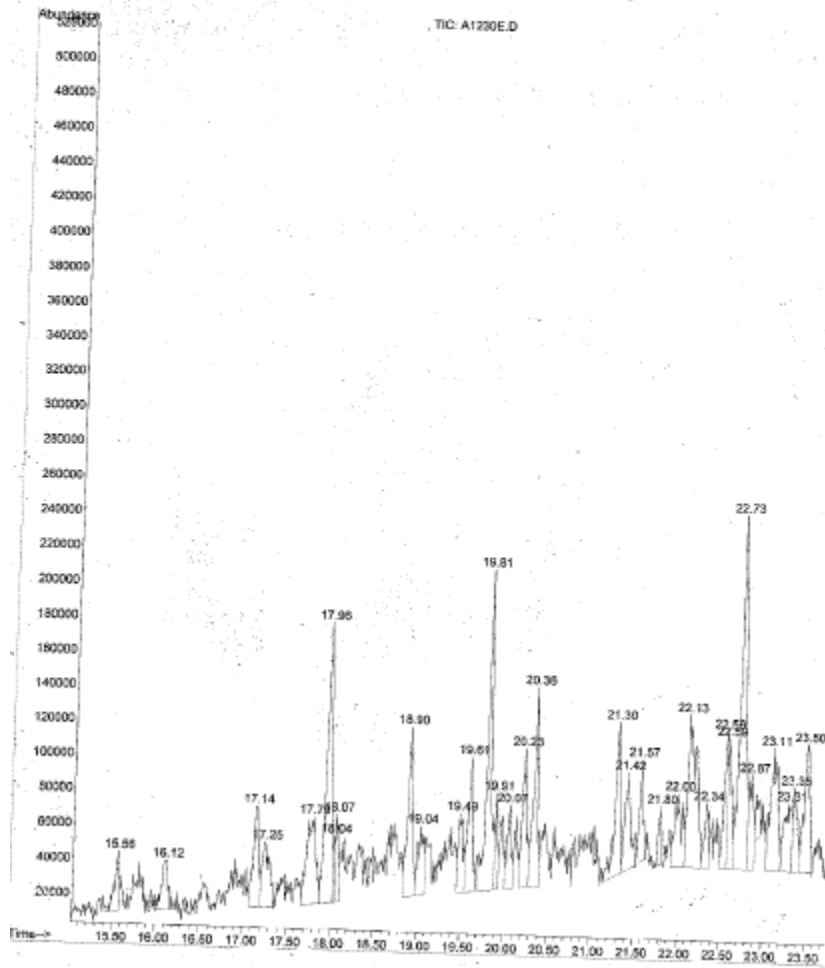
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Supplementary Figure 1. GC-MS analysis of *Asteracantha longifolia*



File : C:\NCPHEM\DATA\A1230E.D
Operator :
Acquired : 30 Dec 2013 5:31 am using AcqMethod STU-1
Instrument : GC/MS * P
Sample Name : stu-paa
Misc Info :
Vial Number : 1



File : C:\NFCHEM\1\DATA\A1230E.D
Operator :
Acquired : 30 Dec 2013 5:31 am using AcqMethod SIU-1
Instrument : GC-MS - P
Sample Name : stu-sax
Misc Info :
Vial Number : 1

