



RESEARCH ARTICLE

**Chemical Characterisation from GC-MS Studies of Ethanolic Extract of
'*Andrographis Paniculata*' for the Authentication and Quality Control**

Bhagyalakshmi¹, K.S. Leelavinodh², K. Jegatheesan³, G. Rajalashmi^{*1}

^{*1}PG & Research Department of Biochemistry, Adhiparasakthi College of Arts and Science Kalavai
Vellore District, Tamil Nadu, India.

²Department of Zoology, Thiruvalluvar University, Serkkadu, Vellore-632 001, Tamil Nadu, India.

³Director, VI Institute of Technology Chengalpet, Taluk Kanchipuram, District – 603108.

Manuscript No: IJPRS/V2/I3/00142, Received On: 02/09/2013, Accepted On: 10/09/2013

ABSTRACT

Andrographis paniculata is traditionally used for treating different ailments. The present investigation was carried out to determine the possible chemical components from *Andrographis paniculata* by GC-MS technique. This analysis revealed that the ethanol extract from Tiruvanamalai, Kancheepuram, Vellore District from Tamil Nadu. The compounds are classified into hydrocarbons (E)-tetra dec3-ene, alcohol (6-methyl heptan-ol), aromatic (undecan5-yl benzene) dodecan 5-ylbenzene, undecan 2-ylbenzene, (2-methyl undecan6-ylbenzene and dioctyl phthalate).

KEYWORDS

Andrographis Paniculata, Ethanolic extract, GC-MS technique.

INTRODUCTION

Plant is man's friend in survival, giving him food and fuel and medicine from the days beyond drawn of civilization². Plant continue to be a major source of medicine, as they have throughout human history⁴. Use of plants as a source of medicine has been inherited and is an important component of the health care system. India is the largest producer of medicinal herbs and is appropriately called the botanical garden of the world¹. Plant products also play an important role in health care systems of the remaining 20% of the population, mainly residing in developed countries. The Natural Health Product Regulations of Canada promulgated in January 2004 is an important step toward modernization of plant-based product usage in healthcare¹³.

Plants have been an important source of medicine for thousands of years. The rich resource is decreasing at an alarming rate as a result of over – exploitation. The medicinal value of drug plants is due to the presence of some chemical substances in the plant tissues which produce a definite physiological action on the human body. These chemicals include alkaloids, flavanoids, glucosides, tannins, gums, resins, essential oil, fatty oils, carbon compounds, hydrogen, oxygen, nitrogen salts of some chemicals etc. Very few of these chemicals are toxic also. Hence, preparation and administration of drugs should be done by experts only. Drugs may be obtained from various parts of the plant. So, an extensive study is required to detect the medical properties of the plant. Several medicinal plants have been tried against pathogenic microorganisms¹⁴⁻¹⁵

India is the birth place of renewed system of Indigenous medicine such as siddha, Ayurvedha

***Address for Correspondence:**

G. Rajalashmi

PG & Research Department of Biochemistry,
Adhiparasakthi College of Arts and Science Kalavai,
Vellore District, Tamil Nadu, India.

E-Mail Id: rjiganesan73@gmail.com

and Unani. Traditional systems of medicines are prepared from a single plant or combinations of more than one plant. these efficacy depends on the current taxonomic identify of plant species, use of proper plant part and its biological potency which in turn depends upon the presence of required quantity and nature of secondary metabolite in a raw drug. Traditional system of medicine continued to be widely practiced Global estimate indicates that 80% of about 5 billion population cannot afford the products of the western pharmaceutical industry but they offered theuses of traditional medicines which are mainly derived from plant materials. In this modern world, nowadays plant based drags are widely used and many countries contributes 40-50% of their total, health budget in the population of novel drugs¹⁰⁻¹¹.

Andrographis paniculata is a plant that has been effectively used in traditional Asian medicines for centuries. It is perceived "blood purifying" property results in its use in diseases where blood "abnormalities" are considered causes of disease, such as skin eruptions, boils, scabies, and chronic undetermined fevers.

Herbal medicine represents one of the most important fields of traditional medicine all over the world. To promote the proper use of herbal medicine and to determine their potential as sources for new drugs, it is essential to study medicinal plants, which have folklore reputation in a more intensified way⁹.

Andrographis paniculata (Family Acanthaceae) is available abundantly in south eastern Asia i.e., India, Sri Lanka, Pakistan and Indonesia. It is found in wild through out of plains of India especially in Tamilnadu, Karnataka, Maharashtra, Orissa, Uttar Pradesh and Uttarakhand. It is generally found in all kinds of vegetative lands i.e., in pine, evergreen, deciduous areas, along roads and villages. It is easily cultivated from seeds on all types of soil.

Nilavembu, sirunangai, sirivanangai (Tamil). It is found throughout India, common in *Andrographis paniculata*. Particularly in Khasi hills undergrowth in deciduous forests and has

historically been used to treat an assortment of diseases. It is known by various names in different languages as "Nelavemaa" in Telugu, "Kirayat" in Hindi, "Nilav Epp" in Malayalam, "Nelabevu" in Kannada, " King of bitters" in English, *Andrographis Paniculata* is reported to possess number of medicinal properties.

Andrographis paniculata it has been used for centuries as a medicinal herb for the treatment of upper gastrointestinal tract and upper respiratory infections, fever, herpes and other chronic diseases. It has a broad range of pharmacological effects. The primary medicinal component of *A.paniculata* is andrographolide has been reported for its anti-cancer⁶, anti-HIV³ cardioprotective⁸ and hepatoprotective⁷

MATERIALS AND METHOD

Andrographis paniculata plant is collected form forest area at Vellore District, Tiruvanamalai district and kancheepuram district. The leaves were sun-dried, ground and soaked in a solution of ethanol for 48 hours after 48 hours the samples were cooled and filtered. The filtrates were subjected to evaporation at 352k in order to leave the sample free of ethanol. The stock solution of the extract so obtained, were used in preparing different concentrations of the extract by dissolving 0.1-0.5g of the extract in 1L solution of 0.1m of HCL. The extract of the plant leaf was used for GC-MS analysis. 2mg of the ethanolic extract of *Andrographis paniculata* was employed for GC/MS analysis.

GC-MS

GCMS is a powerful technique used for many applications which has very high sensitivity and specificity. Generally its application is oriented towards the specific detection and potential identification of compounds based on the molecular mass in a complex mixture. The aim of the present study is to develop a rapid method for the quantitative determination of organic compounds in herbs by GC-MS technique. It is therefore essential that efforts should be made to introduce new medicinal plants to develop cheaper drugs. Plants still represent a large untapped source of structurally novel

compounds that might serve as lead for the development of novel drugs¹².

GC-MS Instrumentation

Mass spectrometry has become one of the most important analytical tools of today. The use of it has spread to a large number of area such as molecular physics, chemistry, biology and medicine. One of the important analytical tools placed in SAIF, IITM is GC-MS. It is a combination of Agilent technologies (Gas chromatographic system) and Jeol GC mateII (mass spectrometry).

GC Conditions

COLUMN : CP-Sil88m X 0.25mm, Film Thickness 0.1 μ m

OVEN TEMP: 100°C(1.5min) -> 20°C/min-> 180°C(0 min) -> 4° C/min -> 270°C (27 min)

INJECTION: optic 2 used 5 μ L

MS Conditions

Resolution : 3,000
 Switching : Electric Field
 Detector Voltage : 600 V
 Pre amp : X100
 Altenuator : 1/16
 Cycle Time : 0.44sec
 Ionization Voltage: 40V

RESULTS

Characterizations of Peaks Obtained from GC-MS Spectrum of Ethanol Extract of *Andrographis paniculata* from Tiruvanmalai District

The results pertaining to GC-MS analysis leads to the identification of number of compounds from the GC fractions of the ethanolic extract of *Andrographis paniculata* from Tiruvanmalai district. These compounds were identified through mass spectrometry attached with GC. The various components present in the leaf of *Andrographis paniculata* that were detected by the GC-MS peaks are

shown in figure 1 and this compounds are listed in the Table 1.

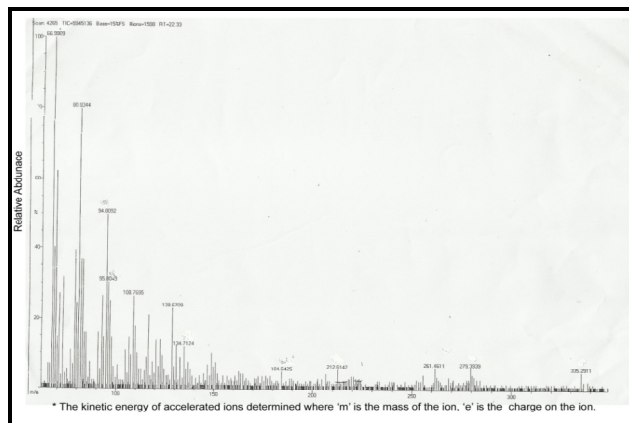


Figure 1: Graphical representation of *Andrographis paniculata* collected from Tiruvanmalai District

Characterisation of Peaks Obtained from GC-MS Spectrum of Ethanol Extract of *Andrographis paniculata* from Kancheepuram District

The results pertaining to GC-MS analysis leads to the identification of number of compounds from the GC fractions of the ethanolic extract of *Andrographis paniculata* from Kancheepuram district. These compounds were identified through mass spectrometry attached with GC. The various components present in the leaf of *Andrographis paniculata* that were detected by the GC-MS peaks are shown in figure 2 and this compounds are listed in the Table 2.

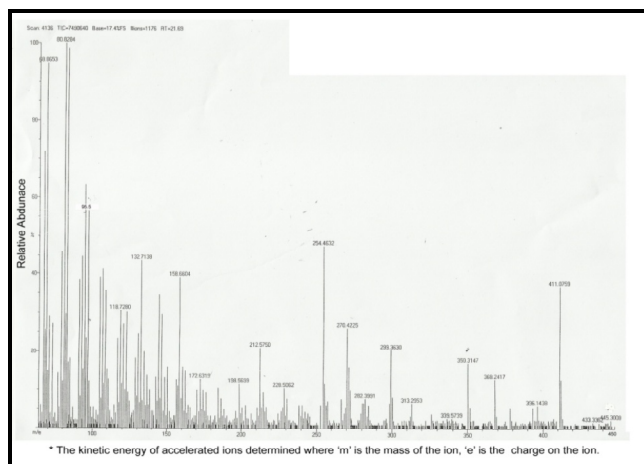


Figure 2: Graphical representation of *Andrographis paniculata* collected from Kancheepuram District

Table 1: Characterization of peaks obtained from GC-MS spectrum of ethanol extract of *Andrographis paniculata* from Tiruvanamalai district

S.No	RT(s)	Mol. wt (g/mol)	Name of compound	Mass peak	Activities
1	22.3	95.8	3-methyl pyridine	4	Manufacture of fragrance, Distillation process, etc
2	22.3	134.71	2-chloroheptane	3	For the manufacture of Biomedical products, Thermal conductivity as function of temperature and pressure
3	22.3	184.64	Dibromomethane	1	As a antiknock additive in leaded fuels, soil fumigants pesticide, etc.
4	22.3	212.61	Octahydro1,4,9,9 tetramethyl 1H -7 Methanoazulene	1	Building block for the manufacture of Pharmaceuticals.
5	22.3	279.39	Oleamide	3	Intermediate product which is used for the production of polymers
6	22.3	367	Ethyl docosanoate	1	Plasticizers and Stabilizers in polymer industries, etc.

Table 2: Characterization of peaks obtained from GC-MS spectrum of ethanol extract of *Andrographis paniculata* from Kancheepuram district

S. No	RT(s)	Mol.wt (g/mol)	Name of compound	Mass peak	Activity
1	21.69	95.5	3-methyl pyridine	3	Manufacture of fragrance, distillation process, etc.
2	21.69	132.7	6-methylheptan1-ol	2	Industrial intermediate, Particularly for the manufacture of Butyl Acetate
3	21.69	198.5	Tetradec 3-ene	3	Production of Amines and Amine Oxides, Oxo-alcohols, Alkylated Aromatics, Alphe Olefins Sulfonates, tanning oils, etc
4	21.69	228.5	Dodecan 5-yl benzene	2	H2 Receptor Antagonist, etc.
5	21.69	299.3	Methyl stearate	4	Production of Polymers, Pharmaceuticals, Solvents and food additives, etc.
6	21.69	366.3	Ethyl docosanoate	3	Plasticizers and Stabilizers in polymer industries, etc.
7	21.69	396.14	Dicotyl Phthalate	3	Plastizer.

Characterization of Peaks Obtained from GC-MS Spectrum of Ethanol Extract of *Andrographis paniculata* from Vellore District

The results pertaining to GC-MS analysis leads to the identification of number of compounds from the GC fractions of the ethanolic extract of *Andrographis paniculata* from Vellore district. These compounds were identified through mass spectrometry attached with GC.

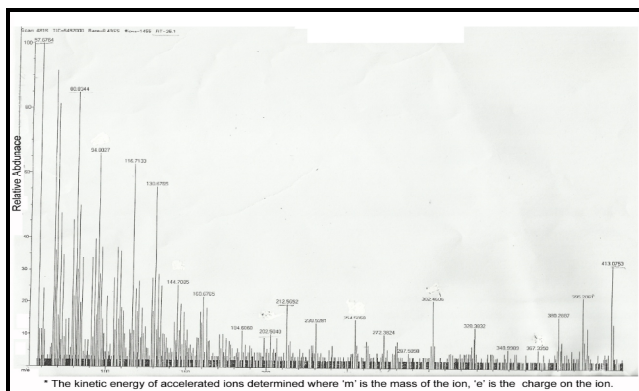


Figure 3: Graphical representation of *Andrographis paniculata* collected from Vellore District

The various components present in the leaf of *Andrographis paniculata* that were detected by the GC-MS peaks are shown in figure 3 and this compounds are listed in the Table 3.

DISCUSSION

The present study the *Andrographis paniculata* collected from three different district, have different compounds which is classified into hydrocarbons(E)-tetra dec3-ene,alcohol(6-methyl heptan-ol),aromatic (undecan5-yl benzene) dodecan 5-ylbenzene,undecan 2-ylbenzene,(2-methyl undecan6-ylbenzene and dioctyl phthalate).

The comparative study of *Andrographis paniculata* obtained from the superior genotype for crop improvement as well as for the effective conservation program, the results obtained in the study are important in the exploration of *Andrographis paniculata* genotype for commercial production of compounds which is suitable for quality control application.

Table 3: Characterization of peaks obtained from GC-MS spectrum of ethanol extract of *Andrographis paniculata* from Vellore district.

S.No	RT(s)	Mol.wt (g/mol)	Name of compound	Mass peak	Activities
1	25.1	95.4	3-methyl pyridine	3	Manufacture of fragrance, distillation process, etc.
2	25.1	144.7	1-bromo2 chloroethane	3	For the manufacture of lubricants, reagents, core parmer, etc.
3	25.1	202.5	3,5 di-tert-butyl phenol	3	UV-stabilizer, Anti-oxidant, light protection agents, etc.
4	25.1	254.5	Pentadecanoic acid	3	Production of polymers, pharmaceuticals, solvent and food additives
5	25.1	302.4	Methyl icosanoate	3	Pharmaceuticals and food additives
6	25.1	367.2	Ethyl docosanoate	3	Plasticizers and Stabilizers in polymer industries, etc.

ACKNOWLEDGMENTS

Grateful thanks to the principle, and the staffs of Adthiparasathi College of Arts and Science, Kalvai, Vellore Dt. For help providing the laboratory facilities.

REFERENCES

1. Ahmedull M, Nayar MP, Red data book for Indian plants, 1999, 4, Botanical Survey of India, Calcutta.
2. Bose TK, Choudhary K, Tropical garden plants in colour, 1991, 1.
3. Calabrese C, Berman SH, Babish JG, MaX, Shinto L, Dorr M, Wells K, Wenner GA, Standish LJ, "A phase I trial of andrographolide in HIV positive patients and normal volunteers", *Phytother Res*, 2000, 14, 333-338.
4. Prince L, Prabakaran P, *Asian J. Plant Sci. Res.* 2011, 1.1, 84.
5. Prajapati ND, Purohit SS, Sharma AK, Kumar T, "A Handbook of Medicinal Plants", A Complete Source Book, Agrobios, Jodhpur, India, 2003, 45-46.
6. Sheeja K, Kuttan G, "Activation of cytotoxic T lymphocyte responses and attenuation of tumor growth in vivo by Andrographolide paniculata extract and andrographolide", *Immunopharmacol Immunotoxicol.*, 2007, 29, 81-93.
7. Trivedi NP, Rawal UM, Patel BP, "Hepatoprotective effect of andrographolide against hexachlorocyclohexane-induced oxidative injury. *Integr Cancer Ther.*, 2007, 6, 271-280.
8. Yoopan N, Thisoda P, Rangkadilok N, Sahasitiwat S, Pholphana N, Ruchirawat S, Satayavivad J, "cardiovascular effects of 14 deoxy11,12 didehydro andrographolide and Andrographis paniculata extracts", *planta Med.*, 2007, 73, 503-511.
9. El-Fak FK, Attif O, Aboul Ela M, Gaanem N, *Alexandrian Journal of Pharmaceutical Science.* 1995, 9, 35-37.
10. Karthishwaran S, Mirunalini G, Dhamodharan M, Krishnaveni, Arulmozhi V, *J. Biol. Sci*, 2010, 242-246.
11. Sati SC, Sati N, Rawat U, Sati OP, *Res, J. Phytochem.*, 2010, 22-31.
12. Cowan MM, "Plants products antimicrobial agents", *Clin. Microbial. Rev*, 1999, 14, 564- 584.
13. Siow YL, Gong Y, Au-Yeung KK, Woo CW, Choy PC, "Emerging issues in traditional Chinese medicine", *Can. J. Physiol. Pharmacol.*, 2005, 83, 321-334
14. Haraguchi H, Kataoka S, Okamoto S, Hanafi Manad, Shibata K, "Antimicrobial triterpenes from Iles integra and the mechanism of antifungal action", *Phytotherapia Residence*, 1999, 13, 151-156.
15. Sashikumar JM, Remya M, Janardhanan K, "Antimicrobial of ethano medicinal plants of Nilgiri biosphere reserve and Western Ghats", *Asian Journal of Microbiology, Biotechnology and Environmental science*, 2003, 5, 183-185.