Research Article [Ambethkar & Ananthalakshmi, 5(3): March, 2014:3389-3393]
CODEN (USA): IJPLCP ISSN: 0976-7126

INTERNATIONAL JOURNAL OF PHARMACY & LIFE SCIENCES
(Int. J. of Pharm. Life Sci.)

GC-MS analysis on the methanolic extract of *Trichosanthes anguina L.* root

A. Ambethkar[1] and S. Ananthalakshmi[2]
1, PG and Research Department of Botany, Periyar EVR College, Tiruchy, (TN) - India
2, PG and Research Department of Chemistry, Urumu Dhanalakshmi College, Tiruchy, (TN) - India

Abstract

Phytochemical screening of *Trichosanthes anguina L.* (Snake gourd) root was done through GC-MS . The present research was designated to investigate the methanolic extract used by GC-MS Technique (Thermo GC-Trace ultra version 5.0, Fisher, USA). The 1.0 ml/min volume of methanolic extract sample injected into the instrument was detected by splitless injection technique. The compounds were separated using Helium (1.0 ml/min) as the carrier gas. The GC-MS analysis provides eight major peaks determining the presence of twelve major compounds namely ester (15.13 %); alcohol (2.12 %) ; heterocyclic compound (19.67 %) ; amine/ amide (0.51 / 0.41 %) ; thioether (0.51 %) ; diene (9.88%) ; aldehyde (9.88%) ; nitrocompound (1.35%) ; ketone (0.56%); alkene (0.56 %) ; amino compound (1.17%) and amino acid (0.61 %). The presence of various main bioactive compounds namely furan, pyrrol-1-oxide and 4-cyanomethyl-3-pyrrolepropiono nitrile methyl esters and other heterocyclic compounds which confirm the medicinal importance of the plant.

Key-Words: Phytocomponents, *Trichosanthes anguina L.*, Methanolic extract, Medicinal plants, Profile

Introduction

Since, thousands of years the plants have been an important source of medicine. Even today, the World Health Organization estimates mainly on traditional remedies such as plants and herbal products for their medicines. The genus *Trichosanthes. L.* is the largest genus of Cucurbitaceae (Rugayah and Dewilde, 1999; Huang *et al.*, 2007). It comprises about 100 species of which a few being the most important *Trichosanthes cucumerina L. var. anguina* (L.) Haines is commonly known as snake gourd. Most gourd specialists agree that *Trichosanthes anguina L.*, and *T. cucumerina L.*, are the same species, recommending however, that the name *Trichosanthes angina L.*, served for wild species (ECHO, 2000) . Among them, the *var. anguina (L)* Haines is the cultivated with its elongated fruits.

The whole plant is richly constituted with a series of secondary metabolites such as flavonoids, carotenoids, phenolic acids etc,. The nutritional values make the plant pharmacologically and therapeutically active. It has a prominent place in alternative systems of Ayurvedic and Siddha medicines due to the various pharmacological activities like anti-diabetic, hepato-protective, cytotoxins, anti-inflammatory and larvicidal effects (Longman, 2002).

*** Corresponding Author**
E.mail: arumbu1959@gmail.com

The species possess antiviral compounds like Trichosanthin and Trichoanguin. The Trichosanthin is reported to have anti-HIV properties (Ferrari *et al*., 1991). These compounds have been used in the treatment of skin diseases, cough, ulcer etc.The plant is known as an appetizer, digestive, germicide, laxative and aphrodisiac (Sivarajan and Balachandran, 1994: Chatterjee and Prakashi, 1997). Most valuable phytochemicals are products of plant secondary metabolism. Secondary metabolites are compounds produced in plants that are not necessary for the plants basic functions. Plant roots are a vast repository of bioactive compounds that include a bewildering diversity of metabolites and bonafide proteins and therefore, considered as the site of unique metabolic activities of the whole plant (Bais *et al*., 2001). Screening of active compounds extracted from the plants has lead to the invention of new medicinal drugs which have efficient protection and treatment roles against various diseases including cancer, (Sheeja and Kuttan, 2007) and Alzheimers disease (Mukherjee *et al*., 2007).

In the past several years Gas Chromatography Mass Spectrometry has been firmly established as a key technological platform for metabolites profiling in both plant and non-plant species (Robertson, 2005). The objective of the study was to identify the

phytocomponents from *Trichosanthes anguina L.*, root extract by GC-MS analysis.

Material and Methods

Collection and preparation of plant material

The fresh roots (Fig.1.) of *Trichosanthes anguina L.*, were collected from the experiment garden. The samples were washed thoroughly in running tap water to remove soil particles and adhered debris and finally washed with sterile distilled water. The roots were shade dried and ground into fine powder, sieved, labeled and kept in amber coloured containers and stored in refrigerator for GC-MS.

Plant sample extraction

1 gm of the sample was transferred to 2 ml effendroff and to that contents 2 ml of HPLC grade methanol was added and the tube was tightly sealed. The sealed tube was kept in a sonicator for 20-30 minutes for sonication. After that the dissector under reduced pressure for 4-7 days for the evaporation, to remove the excess amount of methanol present in it. To the residue obtained, 1 ml of HPLC grade methanol was added to dissolve it and was centrifuged for 8 minutes at 800 rpm. The supernatant liquid was decanted by simple filtration and sterilized. The sterilized filtrate was used for the GC-MS analysis.

GC-MS analysis

GC-MS analysis was done by using GC-Mass spectrometer system (Model, Thermo GC-Trace ultra version 5.0, Thermo MS DSQ-II, Thermo Fisher, USA), DB 35-MS Capillary standard non-polar column (30 mts. X 0.25 mm, 0.25 m film thickness). Oven temperature programme from 80-250 ºC at 6 ºC /min and the final temperature kept for 10 min., injector temp. 250 ºC. Carrier gas Helium, flow rate 1.0 ml/min, the volume of injected specimen was 1 ml of methanol extract, splitless injection technique, ionization energy 70 eV, in the electronic ionization mode; ion source temp. 200 ºC, scan mass range of m/z 50 – 650 and interface line temperature 250 ºC.

The constituents present in the analyzed root samples of *Trichosanthes anguina L.*, are identified in comparison with their specters of mass with those gathered in a library search (NIST - MS) results and with those reported in the literature (Chemdata.nist.gov/).

Results and Discussion

The results pertaining to GC-MS analysis leads to the identification of number of compounds from the GC fractions of the methanolic extract of *Trichosanthes anguina L.* root. These compounds are identified through mass spectrometry attached with GC. The results of the present study are tabulated (Table - 1). The presence of eight major peaks (Fig.2), where all phytoconstituents are characterized and identified. The retention times (RT) of compounds are given in minutes. The twelve major compounds are identified according to the active functional groups with their maximum time (RT) present in the constituents – ester (20.97, 29.78 & 31.51 min.); alcohol (10.62 & 14.96 min.); heterocyclic compound (9.91 & 24.19 min.); amine/amide (3.27 & 22.07 min.); thioether (3.27 & 22.07 min.); diene (14.96 & 18.18 min.) ; aldehyde (18.18 min.); nitro compound (29.96 min.); ketone (14.08 min.); alkene (14.08 min.); amino compound (27.78 min.) and amino acids (37.50 min.). The above mentioned compounds are given according to their functional groups (with max. % of area) present in the constituents-esters (15.13); alcohol (2.12); heterocyclic compound (19.67); amine/amide (0.51/0.41); thioether (0.51); diene (9.88); aldehyde (9.88); nitrocompound (1.35); ketone (0.56); alkene (0.56); amino compound (1.17) and amino acids (0.61). Among the compounds, more percentage of area occurred are heterocyclic compounds (19.67), ester (15.13) and aldehyde (9.88).

The presence of various chemical constituents of *Trichosanthes anguina L.* root have been screened for their therapeutic potential. We resorted to GC-MS studies mainly because of the fact that it required minimum amount of plant material for the identification of numerous compounds. Several phytochemical screening studies have been carried out in different parts of the world using GC-MS (Wu *et al.*, 2010; Vohra *et al*., 2011, and Sangetha *et al.*, 2011). The heights of the peak indicate the relative concentrations of the components present in the sample. The mass spectrometer analyzes the compounds eluted at different times and percentage of area occurred to identify the nature and structure of the compounds. The large compound fragments into small compounds giving rise to appearance of peaks at different m/z ratios. The abundance of ester derivative of decanoic acid is found in the root of *Calliandra portoricensis* (Orishadipe *et al*., 2010). This type of methanolic extract was prepared from underground bulb of *Ornithogalum procerum* (Delazer *et al*., 2009) reported that the hydrolyzed methanolic extracts contained polysterol type compounds and plant sterols. In our investigation the heterocyclic compound and its derivatives such as pyrrol-1-oxide, nitride and furan were common in the extract. In addition, sporadic appearance of important medicinal compounds such as amino compounds and amino acids are noted in our methanolic extracts derived from the root of *Trichosanthes anguina L*.

Conclusion

The GC-MS analysis showed the existence of various compounds of medicinal importance. The screening of root extract showed occurrence of high percentage area of heterocyclic compounds (19.67) and their derivatives when compared to ester (15.13) and aldehydes (9.88). Our sample showed derivatives of heterocyclic compounds namely furan, pyrrol-1-oxide and 4-cyanomethyl-3-pyrrolepropiono nitrile methyl esters are more abundant in the sample. The report is the first of its kind to analyze the chemical constituents from the methanolic extract of *Trichosanthes anguina L*. root using GC-MS.

References

1. Bais, HP. Vargas, VML. Flores, HE. Vivanco, JM. (2001). Root-specific metabolism the biology and biochemistry of underground organs. *In vitro* Cellular & Developmental *Biology Plant*. 37: 730-741.
2. Chatterjee, A. and Prakashi, SC. (1997). The Treatise of Indian Medicinal Plants, Vol. 5. National Institute of Science Communication and Information Resources, New Delhi, India. 2278.
3. Chemdata,nist.gov/
4. Delazar, A., Nazifia, E., Movafeghi, A., Nahar, L., Nazemiyeh, H., Moghadam, SB., Asnaashari, S., Sarkar, SD. (2008). GC-MS analysis of *Ornithogalum procerum.* DARU Vol. 17, No.1.
5. ECHO,(2000). Snake Gourd. ECHO. Plant information Sheet, USA. http//:www.echonet.org.
6. Ferrari, P., Trabaud, M.A. Rommain, M., Mandine, E., Zalizsz, R., Desgranges, C. and Smets. P. (1991). Toxicity and activity of purified trichosanthin. AIDS. S(T): 865-870.
7. Huang, LA., Lu, A. and Jeffrey, C. (2007). *Trichosanthes*. In: Flora of China, Vol.1. (draft); available online at http:// flora. Huh. Harward.edu / China / mass / volume 19 / *Cucurbitaceae*-MO-Coauthoring.
8. Longman. (2002). Indian Medicinal Plant Compandium of 500 species, Orient Pvt. Ltd. New Delhi.
9. Mukherjee, PK., Kumar, V., Houghton, PJ. (2007). Screening of Indian Medicinal Plants for acetyl cholinesterase inhibitory activity phytother Res; 21: 1142-1145.
10. Orishadipe, AT., Okogun, JI. and Mishelia, E. (2010).Gas chromatography-Mass Spectrometry analysis of the hexane extract of *Calliandra portoricensis*
11. Robertson, DG. (2005). Metabonomics in toxicology: A review. *Toxicol Sci,* 85: 809-822.
12. Rugayah, EA. and De Wilde, WJJO. (1999). Conspectus of *Trichosanthes* (*Cucurbitaceae*) in Malesia. Reinwardtia, 1: 227-280.
13. Sandhya, S., Vinod, KR., Sekhar, JC. Aradhana, R., Nath, VS. (2010). An updated Review on *Trichosanthes cucumerina* L. Vol.1. Issue 2: 56-60.
14. Sheeja, K. and Kuttan, G. (2007). Activation of cytotoxic T. lymphocyte responses and attenuation of tumour growth *in vivo* by *Andrographis paniculata* and andrographolide. *Immunopharmacol Immunotoxicol*; 29: 81-92.
15. Sivarajan, VV. and Balachandran, I. (1994). Ayurvedic drugs and their plant sources. Oxford & IBH Publ. Co.Ltd., Calcutta. pp. 370-371.
16. Vohra, A. and Kaur, H. (2011). Chemical investigation of Medicinal Plant *Ajuga bracteosa. J. Nat. Pro. Plant Resour.* 1 (1): 37-45.
17. Wu, LY. Gao, HZ. Wang, XL. Ye, JH. Lu, JL and Liang, YR. (2010). Analysis of chemical composition of *Chrysanthemum indicum* flowers by GC-MS and HPLC. *Journal of Medicinal Plants Research* Vol. 4 (5), pp.421-426.

Fig. 1: Harvested fresh root of *Trichosanthes anguina L.*

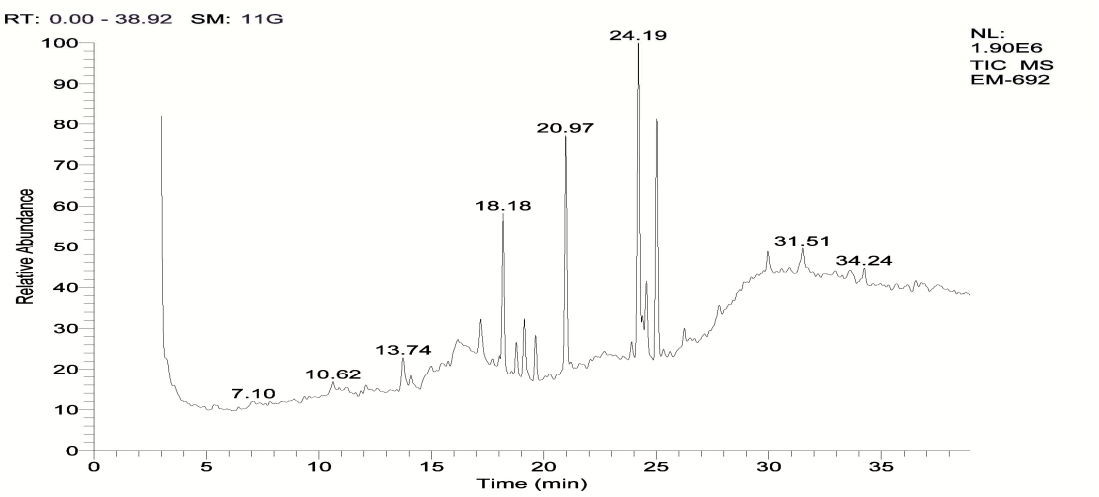

Fig. 2: GC-MS chromatogram of methanolic extract of *Trichosanthes anguina L.* root

Table 1: The compounds present in the methanolic extract of *Trichosanthes anguina L.* root

Sl. No.	RT	Name of the compound	M.F.	M.W	Area (%)	(Common name) / Functional group
1	3.27	[1,1-2H] Neopentyl alcohol	$C_5H_{10}D_2O$	88	0.51	Alcohol
2	3.27	3-(2-Hydroxy ethoxy) propylamine	$C_5H_{13}NO_2$	119	0.51	Amine
3	3.27	1,1-Dimethylethyl-3-dueteriopropyl thioether	$C_7H_{15}DS$	132	0.51	Thio ether
4	3.27	Hexyl propanoate	$C_9H_{18}O_2$	158	0.51	Ester
5	10.62	(E)-Ethyl 2-(benzyloxycarbonylamino)dec-2-enoate	$C_{20}H_{29}NO_4$	347	0.72	Ester

6	10.62	1-Heptacosanol	$C_{27}H_{56}O$	396	0.72	Alcohol
7	10.62	Propargyl 2,2,3,3-tetramethylcyclopropane-1-carboxylate	$C_{11}H_{16}O_2$	180	0.72	Carboxylic derivative
8	13.74	Decanoic acid,methyl ester	$C_{13}H_{26}O_2$	214	2.62	Ester
9	13.74	Nonanoic acid, methyl ester	$C_{10}H_{20}O_2$	172	2.65	Ester
10	14.08	2-(E-Cinnamido)-1,4-benzoquinone	$C_{15}H_{11}NO_3$	253	0.56	Ketone
11	14.08	2-(1,3-Dioxolan-2-yl)-1-phenylethene	$C_{11}H_{12}O_2$	176	0.56	Alkene
12	14.96	3-Isopropyl-1,4-petadiene	C_8H_{14}	110	2.12	Diene
13	14.96	1-[1-Chloro-1-henylsulfinyl)heptyl]-2-cyclopenten-1-ol	$C_{16}H_{14}Cl_2O_2S$	340	2.12	Alcohol
14	18.18	Tridecanal	$C_{13}H_{26}O$	198	9.88	Aldehyde
15	18.18	Neophytadiene	$C_{20}H_{38}$	278	9.88	Diene
16	18.18	Pentadecanal	$C_{15}H_{30}O$	226	9.88	Aldehyde
17	19.14	Phytol acetate	$C_{22}H_{42}O_2$	338	4.16	Ester
18	19.14	Iavandulyl acetate	$C_{12}H_{20}O_2$	196	4.16	Ester
19	20.97	Octadecanoic acid methyl ester	$C_{19}H_{38}O_2$	298	15.13	Ester
20	20.97	Henecosanoic acid methyl ester	$C_{22}H_{44}O_2$	340	15.13	Ester
21	22.07	N-(2'-Acetylphenyl)-2-aminobenzamide	$C_{15}H_{14}N_2O_2$	254	0.41	Amide
22	22.07	4,4'-Dimethylmonothiobenzil	$C_{16}H_{14}OS$	254	0.41	Thio compound
23	23.91	5-Methyl-3-phenyl-3,4-dihydro-2H-pyrrol-1-oxide	$C_{11}H_{13}NO$	175	1.06	Heterocyclic compound
24	23.91	4-Cyanomethyl-3-pyrrolepropiononitrile	$C_9H_9N_3$	159	1.06	Heterocyclic compound
25	24.19	3-Chloromethylsulfunyl-3-dimethylfuran	C_5H_5ClO	116	19.67	Heterocyclic compound
26	26.25	Isooctanol	$C_8H_{18}O$	130	1.23	Alcohol
27	27.78	Hept-enyl-2-acetate	$C_9H_{16}O_2$	156	1.17	Ester
28	27.78	1-[2-[2-Dimethylamino)ethoxy] ethenyl]-4-methylbenzene	$C_{13}H_{19}NO$	205	1.17	Amino compound
29	29.96	E-3,4-Dinitro-3-hexene	$C_6H_{10}N_2O_4$	174	1.35	Nitro compound
30	29.96	Z-3,4-Dinitro-3-hexene	$C_6H_{10}N_2O_4$	174	1.35	Nitro compound
31	31.51	Neopentyl hydroxyacetate	$C_7H_{14}O_3$	146	2.09	Ester
32	37.50	Cytidine	$C_9H_{13}N_3O_5$	243	0.61	Amino acid

How to cite this article

Ambethkar A. and Ananthalakshmi S. (2014). GC-MS analysis on the methanolic extract of *Trichosanthes anguina L.* root. *Int. J. Pharm. Life Sci.*, 5(3):3389-3393.

Source of Support: Nil; Conflict of Interest: None declared

Received: 23.01.14; Revised: 28.01.14; Accepted:14.02.14