CHEMICAL INVESTIGATION OF TUBERS OF *STEPHANIA WIGHTII* (ARN) DUNN BY GC-MS

Shunmugapriya K and Uthayakumari Kalavathy[1]

Department of Botany, A.P.C.Mahalaxmi College for Women, Tuticorin-628002, Tamil Nadu.
[1]Research Department of Botany, St.Mary's College(Autonomous), Tuticorin-628001, Tamil Nadu.
uthayastmarys@gmail.com

ABSTRACT

Stephania wightii (Arn) Dunn known to the Kanikkars as "Koloukone" is one of the medicinally important plants belonging to the family Menispermaceae. Kanikkar tribe's people of Western Ghats of Tamil Nadu, India, the tubers are used as a medicine in the treatment of cancer. Present study was carried out to analyse the active constituents present in the tuber of said plant. Thirteen compounds were identified in the ethanol extract of *S.wightii* by Gas Chromatography – Mass Spectrometry (GC-MS) analysis. The major components present in the tuber of *S.wightii* were (1H)Indolo(2,1-a)isoquinoline,5,6,11,12-tetrahydro-2,3,8,9-tetramethoxy (59.98%),6H Dibenzo (a,g) quinolizine, 5, 8, 13, 13a-tetrahydro-2, 3, 9,10-tetramethoxy-, (ñ)- (34.86%) and 1, 3-propanediol, 2-(hydroxymethyl) -2-nitro-(2.89%).

Key words: GC-MS analysis, *Stephania wightii*, Vitamin E

INTRODUCTION

Stephania is a flowering plant in the family Menispermaceae, native to eastern and southern Asia and Australia. They are herbaceous perennial vines growing to around four metres tall, with a large, woody caudex. The leaves are arranged spirally on the stem, and peltate, with the leaf petiole attached near the centre of the leaf. The name *Stephania* means "a crown". This refers to the anthers being arranged in a crown like manner. *Stephania wightii* (Arn) Dunn known to the Kanikkars as "Koloukone" is an important medicinal plant. The Kanikkar tribes, inhabitants of Agasthiarmalai Biosphere Reserve, Western Ghats, Tamil Nadu, India use the paste prepared from tubers with water to treat cancer (Lalitharani *et al*., 2010). To our knowledge, no chemical analysis has been reported on this plant. The present communication deals with the GC-MS analysis of ethanol extract of said plant tuber.

MATERIALS AND METHODS

The tubers from *Stephania wightii* (Arn) Dunn were collected from Karaiyar, Agasthiarmalai Biosphere Reserve, Western Ghats, Tamil Nadu. The samples were air-dried and powdered. Required quantity of powder was weighed and transferred to stoppard flask and treated with the ethanol until the powder is fully immersed. The flask was shaken every hour for the first 6 hours and then it was kept aside and again shaken after 24 hours. This process was repeated for 3 days and then the extract was filtered. The extract was collected and evaporated to dryness by using a vacuum distillation unit. The final residue thus obtained was then subjected to GC-MS analysis.

GC-MS Analysis

GC-MS analysis of these extracts was carried out by following the method of Hema *et al*. (2010). GC-MS analysis were performed using a Perkin-Elmer GC clauses 500 system and Gas Chromatograph interfaced to a Mass Spectrometer (GC-MS) equipped with a Elite-I fused silica capillary column (30m×0.25mm ID × 1µdf), composed of 100% Dimethyl polysiloxane). For GC/MS detection, an electron ionization system with ionizing energy of 70 eV was used. Helium gas (99.999%) was used as the carrier gas at constant flow rate 1ml/min and an injection volume of 2µl was employed split ratio of 10:1 injector temperature 250^{0}C; ion-source temperature 280^{0}C. The oven temperature was programmed from 110^{0}C (isothermal for 2 min) with an increase of 10^{0}C/min to 200^{0}C, then 5^{0}C/min to 280^{0}C, ending with a 9 min isothermal at 280^{0}C. Mass spectra were taken at 70eV; a scan interval of 0.5 seconds and fragments from 45 to 450 Da. Total GC running time was 36 minutes. The relative % amount of each component was calculated by comparing its average peak area to the total areas, software adopted to handle mass spectra and chromatograms was a Turbo mass.

Identification of Components

Interpretation on mass spectrum GC-MS was conducted using the database of National Institute of Standard and Technology (NIST) having more than 62000 patterns. The 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.

RESULTS AND DISCUSSION

The compounds present in the ethanol extract of *S.wightii* were identified by GC-MS analysis (Fig.1). The active principles with a retention time (RT), molecular formula, molecular weight (MW) and concentration (%) in the ethanol extract of *S.wightii* are presented in Table 1. Thirteen compounds were identified in ethanol extract by GC-MS. The major components present in the tuber of *S.wightii* were (1H) Indolo (2,1-a)isoquinoline, 5, 6, 11, 12-tetrahydro-2, 3, 8, 9-tetramethoxy (59.98%), 6H-Dibenzo (a,g) quinolizine, 5, 8, 13, 13a- tetrahydro-2, 3, 9, 10-tetramethoxy-, (ñ)-(34.86%) and 1,3-propanediol, 2-(hydroxymethyl)-2-nitro-(2.89%). Fig. 2,3,4 and 5 show a mass spectrum and structure of (1H)Indolo(2,1-a)isoquinoline, 5, 6, 11, 12-tetrahydro-2, 3, 8, 9-tetramethoxy, 6H-Dibenzo(a,g) quinolizine, 5, 8, 13,13a-tetrahydro-2, 3,9,10-tetramethoxy-,(ñ)-, 1,3-propanediol, 2-(hydroxymethyl)-2-nitro- and Isoquinoline, 6,7-dimethoxy-1-methyl-4-(3,4-dimethylphenyl). Table 2 listed the major phytocomponents and its beneficial activities obtained through GC-MS study of tuber of *S.wightii*.

Table 1: Components detected in the ethanol extract of *S.wightii* tuber by GC-MS

No.	RT	Name of the compound	Molecular formula	MW	Peak Area %
1.	7.44	1,3-Propanediol, 2-(hydroxymethyl)-2-nitro-	$C_4H_9NO_5$	151	2.89
2.	12.61	Butanoic acid, 2-methyl-	$C_5H_{10}O_2$	102	0.04
3.	13.42	Cyclohexaneacetic acid, à-ethyl-	$C_{10}H_{18}O_2$	170	0.06
4.	14.71	(6Z)-Nonen-1-ol	$C_9H_{18}O$	142	0.23
5.	14.79	Cyclopentaneundecanoic acid, methyl ester	$C_{17}H_{32}O_2$	268	0.19
6.	15.59	1-Undecyne	$C_{11}H_{20}$	152	0.40
7.	15.66	9-Octadecenal	$C_{18}H_{34}O$	266	0.36
8.	25.38	(1H)Indolo[2,1-a]isoquinoline, 5,6,11,12-tetrahydro-2,3,8,9-tetramethoxy	$C_{20}H_{23}NO_4$	341	59.98
9.	27.82	6H-Dibenzo[a,g]quinolizine, 5,8,13,13a-tetrahydro-2,3,9,10-tetramethoxy-, (ñ)-	$C_{21}H_{25}NO_4$	355	34.86
10.	28.97	Vitamin E	$C_{29}H_{50}O_2$	430	0.15
11.	30.01	Isoquinoline, 6,7-dimethoxy-1-methyl-4-(3,4-dimethylphenyl)-	$C_{20}H_{21}NO_4$	339	0.17
12.	31.25	4-Dodecanol	$C_{12}H_{26}O$	186	0.42
13.	32.52	3-Octanol, 3,6-dimethyl-	$C_{10}H_{22}O$	158	0.25

Table 2: Activity of phytocomponents identified in the ethanol extract of tuber of *S.wightii* by GC-MS

RT	Name of the compound	Molecular Formula	Compound nature	**Activity
7.44	1,3-Propanediol, 2-(hydroxymethyl)-2-nitro-	$C_4H_9NO_5$	Nitrogen compound	Antimicrobial
13.42	Cyclohexaneacetic acid, à-ethyl-	$C_{10}H_{18}O_2$	Acidic compound	Antimicrobial
15.66	9-Octadecenal	$C_{18}H_{34}O$	Aldehyde compound	Antimicrobial
25.38	(1H)Indolo[2,1-a]isoquinoline, 5,6,11,12-tetrahydro-2,3,8,9-tetramethoxy	$C_{20}H_{23}NO_4$	Alkaloid	Antimicrobial Anti-inflammatory
27.82	6H-Dibenzo[a,g]quinolizine, 5,8,13,13a-tetrahydro-2,3,9,10-tetramethoxy-, (ñ)-	$C_{21}H_{25}NO_4$	Alkaloid	Antimicrobial Anti-inflammatory
28.97	Vitamin E	$C_{29}H_{50}O_2$	Vitamin compound	Vasodilator Cancer preventive Hypoglycaemic Antitumor Antioxidant Anti-inflammatory Antiaging
30.01	Isoquinoline, 6,7-dimethoxy-1-methyl-4-(3,4-dimethylphenyl)-	$C_{20}H_{21}NO_4$	Alkaloid	Antimicrobial Anti-inflammatory
31.25	4-Dodecanol	$C_{12}H_{26}O$	Alcoholic compound	Antimicrobial
32.52	3-Octanol, 3,6-dimethyl-	$C_{10}H_{22}O$	Alcoholic compound	Antimicrobial

****Activity Source: Dr.Duke's Phytochemical and Ethnobotanical databases**

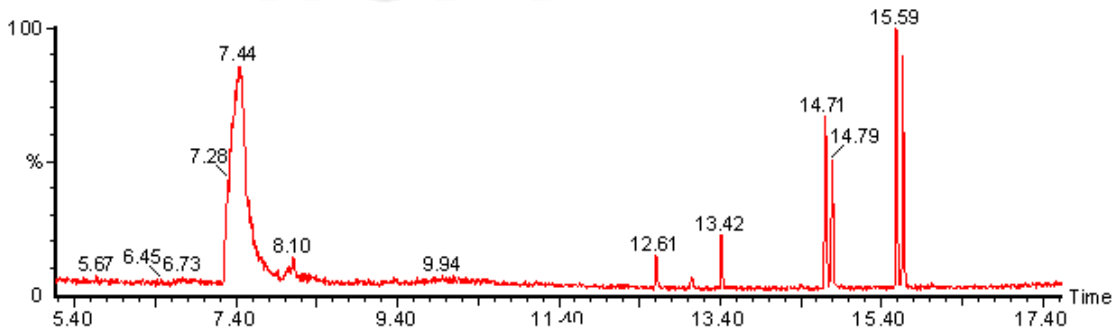

Fig.1: GC-MS chromatogram of the ethanol extract of tuber of *S.wightii*

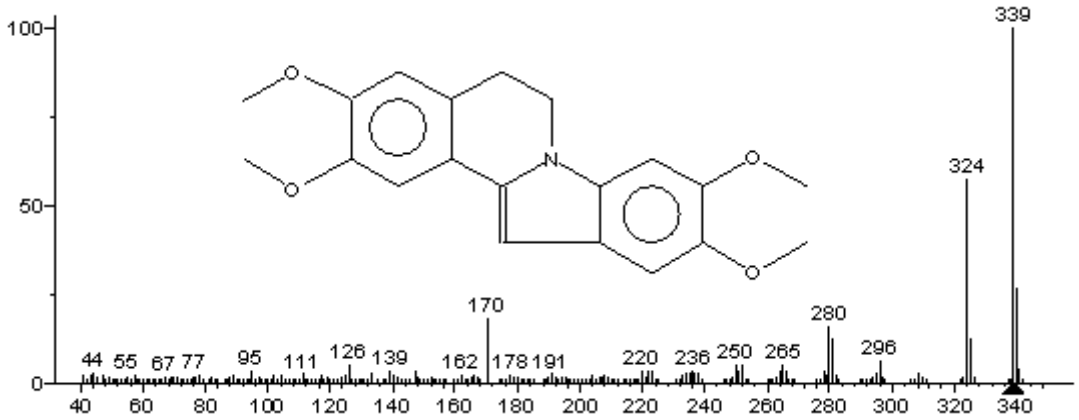

Fig.2: Mass spectrum of (1H)Indolo[2,1-a]isoquinoline, 11,12-dihydro-2,3,8,9-tetramethoxy-

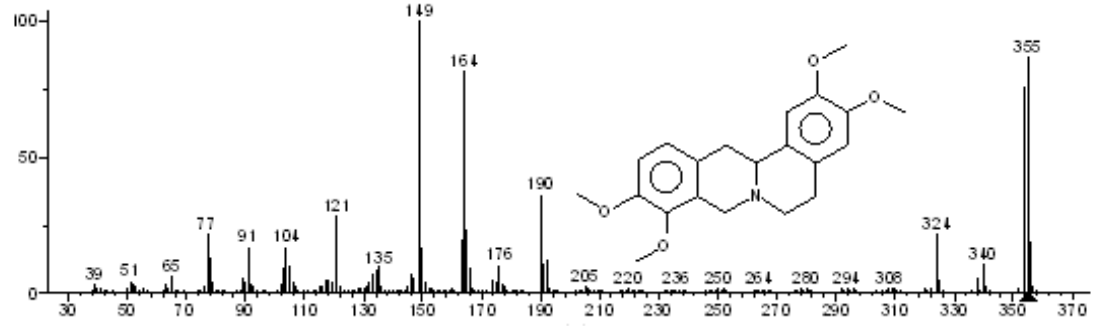

Fig. 3: Mass spectrum of 6H-Dibenzo[a,g]quinolizine, 5,8,13,13a-tetrahydro-2,3,9,10- tetramethoxy-, (ñ)-

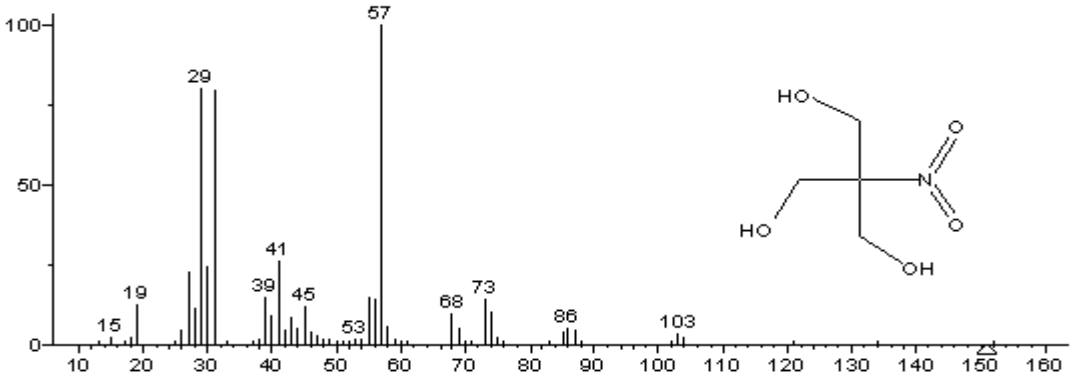

Fig.4: Mass spectrum of 1,3-Propanediol, 2-(hydroxymethyl)-2-nitro-

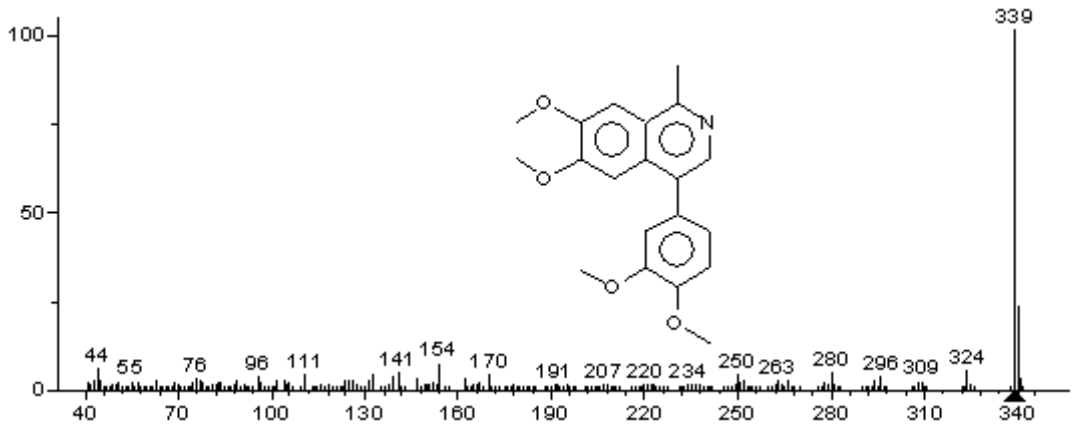

Fig.5: Mass spectrum of Isoquinoline, 6,7-dimethoxy-1-methyl-4-(3,4-dimethylphenyl)-

6H-Dibenzo(a,g)quinolizine,5,8,13,13a-tetrahydro-2,3,9,10-tetramethoxy-,(ñ)- is the principal neuroactive alkaloid with analgesic and hypnotic action (Chou and Hsu, 1992). 6H-Dibenzo (a,g) quinolizine, 5,8,13,13a- tetrahydro-2,3,9,10-tetramethoxy-,(ñ)- is one of the components found in the tuber of *S.wightii* which is being used for the pharmacological work. 1,3-propanediol, 2-(hydroxymethyl)-2-nitro- has been reported as microbicidal and it is used as bacteriostat in disinfectants (Popendorf *et al*., 1995).

In the present study, 13 compounds have been identified from the ethanol extract of tuber of *S.wightii* by Gas Chromatography – Mass Spectrometry (GC-MS) analysis. So it is recommended as a plant of phytopharmaceutical importance. However, further studies will need to be undertaken to ascertain fully its pharmacological activities.

ACKNOWLEDGEMENT

We would like to thank Mr. S.Kumaravel, Senior Scientist, Indian Institute of Crop Processing Industries, Government of India, Tanjavore, Tamil Nadu for providing all the facilities and support used to carry out the work.

LITERATURE CITED

Hema R, Kumaravel S, Gomathi S, Sivasubramaniam C, 2010. Gas Chromatography-Mass Spectroscopic analysis of *Lawsonia inermis* leaves. *NewYork Sci. J*., **3**: 141-143.

Lalitharani S, Mohan VR, Regini GS, 2010. Ethnomedicinal plants used by Kanikkar in Karayar of Agasthiarmalai Biosphere, Western Ghats, Tamil Nadu. *J.Econ.Taxon.Bot*., **34**: 472-477.

Popendorf W, Selim M, Lewis MQ, 1995. Exposure while applying industrial antimicrobial pesticides. *Am. Ind. Hyg. Assoc. J.,* **56**: 993-1001.

Chou YH, Hsu CC, 1992. Chinese drugs of plant origin-chemistry, pharmacology and use in traditional and modern medicine. *Corydalis turtschaninovii* Bees. f. yanhusuo. Tang W Eisenbrand G eds. Springer-Verlag Berlin. 377-393.