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GC-MS Analysis of Methanolic Extract of *Gyrocarpus asiaticus* Willd

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The present study was designed to determine the bio-active compounds in the aerial parts of the methanolic extract of *Gyrocarpus asiaticus* Willd. GC-MS analysis of the aerial parts of the methanolic extract of *Gyrocarpus asiaticus* Willd was performed on a GC-MS equipment (Thermo Scientific Co. Thermo GC-TRACE ultra ver.: 5.0, Thermo MS DSQ II). The preliminary phytochemical tests showed the presence of alkaloids, cardiac glycosides, flavonoids, phenols, saponins, steroids, tannins and terpenoids in methanolic extract of *Gyrocarpus asiaticus* Willd. The GC-MS analysis has shown the presence of fifteen different phytochemical compounds in the methanolic extract of *Gyrocarpus asiaticus* Willd. From the results, it is evident that *Gyrocarpus asiaticus* Willd contains various phytocomponents and is recommended as a plant of great phytopharmaceutical importance.

Keywords: *Gyrocarpus asiaticus* Willd, Methanolic extract, GC-MS profiling.

INTRODUCTION

Plants are great potential sources for producing new drugs of benefit to mankind. There are many approaches in the search for new biologically active principles in higher plants[1].

Medicinal aromatic plants are being used against various infections and diseases in the world since past history. In the last few years, gas chromatography mass spectrometry (GC-MS) has become firmly established as a key technological platform for secondary metabolite profiling in both plant and non-plant species[2-4]. It has been shown that *in vitro* screening methods could provide the needed preliminary observations necessary to elect crude plant extracts with potentially useful properties for further chemical and pharmacological investigations[5].

Gyrocarpus asiaticus Willd commonly known as Taniki or Nalla poliki[6] is a tree belonging to the family Hernandiaceae. *Gyrocarpus asiaticus* Willd is one of the species in the genus Gyrocarpus with the class Magnoliopside. *Gyrocarpus asiaticus* barks have different kinds of pharmacological behaviors such as antioxidant activity[7], cytotoxic effects[8] or anticancer activity[9]. The species belongs to this family have various pharmacological activities such as anticancer, antiinflammatory, antispasmodic *etc*[10].

The GC-MS profiling of the methanolic extract helps to identify the compounds present in the aerial parts of *Gyrocarpus asiaticus* Willd, a *hitherto* uninvestigated species. Hence, the aim of this present study is to examine the chemical composition of the methanolic extract of *Gyrocarpus asiaticus* Willd by GC-MS.

EXPERIMENTAL

The aerial parts of *Gyrocarpus asiaticus* Willd plant (healthy and disease free plant samples) were collected from the nearby area of Tirunelveli District fields (Tamil Nadu) in December 2011, identified and authenticated by Dr. V. Chelladurai (Retired Research Officer-Botany, Central Council for Research in Ayurveda and Sidda, Govt. of India), Tiruneveli, Tamil Nadu, India. A portion of dried aerial parts (120 g) of *Gyrocarpus asiaticus* Willd was placed in a soxhlet apparatus. Extraction was performed with 800 mL of methanol for 48 h at a temperature not exceeding the boiling point of the solvent. Extract was filtered through a 45 µm filter. The resulting solution was concentrated in vacuum to dryness to give methanolic extract (8.5 g). The extract was stored in a refrigerator for further use.

The methanolic extract was tested for alkaloids, anthroquinones, flavonoids, phenols, steroids, tannins, terpenoids[11], cardiac glycosides, saponins[12], phlobatannin[13], reducing sugars[14], carbohydrates and protein/amino acids[15].

The phytochemical investigation of methanolic extract was performed on a GC-MS equipment (Thermo Scientific Co. Thermo GC-TRACE ultra ver.: 5.0, Thermo MS DSQ II). Experimental conditions of GC-MS system were as follows:

TABLE-1
COMPOUNDS IDENTIFIED IN THE EXTRACT OF *Gyrocarpus asiaticus* WILLD BY GC-MS

RT	Name of compound	Compound nature	m.f.	m.w.	Peak area (%)
23.61	3-Acetoxy-4-normethyl-9,19-cyclolanoststan-7-one	Silyl steroidal-oxime	$C_{31}H_{50}O_3$	470	2.03
29.55	Flurandrenolide	Fluro-steroid	$C_{24}H_{33}FO_6$	436	1.95
32.96	Tungsten, pentacarbonyl(4,5-diethyl-2,2,3-trimethyl-1-phenyl-1-phospha-2- sila-5-boracyclohex-3-ene-P1)-,(oc-6-22)-	Alkane	$C_{21}H_{26}BO_5PSiW$	612	2.11
33.24	Difuro[2',3':5,6:3",2":7,8]perylo[1,12 def][1,3]dioxepin-8,15-dione, 10,11,12,13-tetrahydro-1,7-dihydroxy-10,13-dimethyl-	Fused hetero-cyclic ketone	$C_{27}H_{18}O_8$	470	2.17
33.62	Lanosta-7,9(11),20-triene-3á,18-diol, diacetate	Steroid	$C_{34}H_{52}O_4$	524	3.60
34.27	3-[18-(3-Hydroxy-propyl)-3,3,7,12,17-pentamethyl-2,3,22,24-tetrahydro-porphin-2-yl]propan-1-ol	Prophinol	$C_{31}H_{38}N_4O_2$	498	2.52
35.68	Cholestano[7,8-a]cyclobutane,3-methoxy-6-oxo-2'-methylene-	Steroid	$C_{31}H_{50}O_2$	454	2.95
37.56	Rhodoxanthin	Isoprenoid	$C_{40}H_{50}O_2$	562	4.09
38.06	Cyclotrisiloxane, hexaphenyl-	Cyclohexyl siloxane	$C_{36}H_{30}O_3Si_3$	594	2.75
38.38	Cyclotrisiloxane,2,4,6-trimethyl-2,4,6-triphenyl-	Silyl compound	$C_{21}H_{24}O_3Si_3$	408	3.99
38.69	Astaxanthin	Xanthin	$C_{40}H_{52}O_4$	596	5.08
39.53	Cholest-4-en-3-one	Steroid	$C_{27}H_{44}O$	384	5.07
40.02	9,19-Cyclolanostane-6,7-dione,3-acetoxy-	Steroidal ester	$C_{32}H_{50}O_4$	498	2.00
40.38	Rubixanthin acetate	Xanthin	$C_{42}H_{58}O_2$	594	5.82
42.19	Ajmaline, *bis*(trimethylsilyl)-	Silyl fused heterocyclic	$C_{26}H_{42}N_2O_2Si_2$	470	7.68

RT: Retention time (min)

DB 35-MS capillary standard non-polar column, dimension: 30 Mts, ID: 0.25 mm, Film thickness: 0.25 µm. Flow rate of mobile phase (carrier gas: He) was set at 1 mL/min. In the gas chromatography part, temperature programme (oven temperature) was 50 °C raised to 260 °C at 10 °C/min and injection volume was 1 µL. Samples were run fully at a range of 50-650 *m/z* and the results were compared by using Wiley spectral library search programme.

RESULTS AND DISCUSSION

The methanolic extract of *Gyrocarpus asiaticus* Willd showed positive results for alkaloids, cardiac glycosides, flavonoids, phenols, saponins, steroids, tannins, terpenoids, carbohydrates and protein/amino acids. Anthraquinones, phlobatannin and reducing sugars were absent in the *Gyrocarpus asiaticus* Willd methanolic extract.

The results pertaining to GC-MS analysis of the methanolic extract of *Gyrocarpus asiaticus* Willd lead to the identification of a number of compounds. These compounds were identified through mass spectrometry attached with GC. The GC-MS spectrum confirmed the presence of various components with different retention times as illustrated in Fig. 1. The various components present in the aerial parts of *Gyrocarpus asiaticus* Willd that were detected by the GC-MS are shown in Table-1. 3-Acetoxy-4-normethyl-9, 19-cyclolanoststan-7-one, flurandrenolide, tungsten, pentacar-bonyl(4,5-diethyl-2,2,3-trimethyl-1-phenyl-1-phospha-2-sila-5-boracyclohex-3-ene-P1)-, (oc-6-22)-, difuro[2',3':5,6:3", 2":7,8]perylo[1,12-def][1,3]dioxepin-8,15-dione, 10,11,12,13-tetrahydro-1,7-dihydroxy-10,13-dimethyl, lanosta-7,9(11), 20-triene-3á,18-diol, diacetate, 3-[18-(3-hydroxy-propyl)-3,3,7,12,17-pentamethyl-2,3,22,24-tetrahydro-porphin-2-yl]propan-1-ol, cholestano[7,8-a]cyclobutane, 3-methoxy-6-oxo-2'-methylene-, rhodoxanthin, cyclotrisiloxane, hexaphenyl, cyclotrisiloxane, 2,4,6-trimethyl-2,4,6-triphenyl, astaxanthin, cholest-4-en-3-one, 9,19-cyclolanostane-6,7-dione, 3-acetoxy, rubixanthin acetate, ajmaline, *bis*(trimethylsilyl)- were present in the methanolic extracts of *Gyrocarpus asiaticus*.

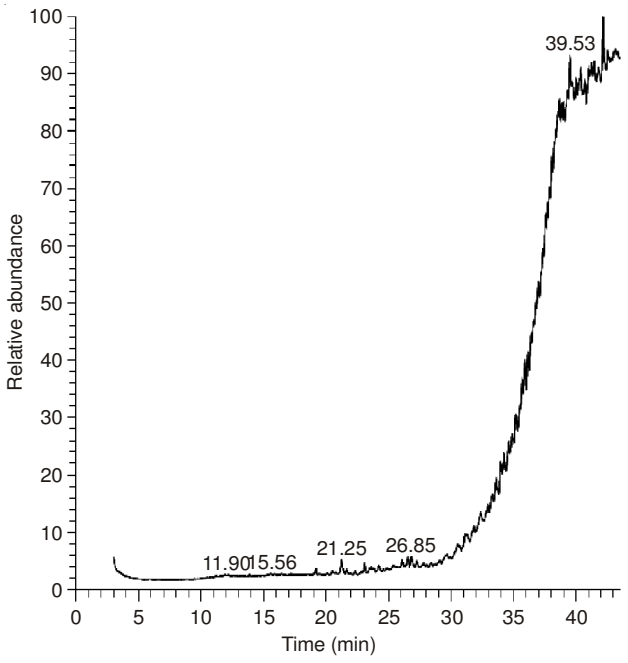

Fig. 1. GC-MS chromatogram of methanolic extract of *Gyrocarpus asiaticus* Willd

The mass spectrometer analyzes the compounds eluted at different times 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. These mass spectra are fingerprint of that compound which can be identified from the data library.

Conclusion

The GC-MS analysis report has shown that *Gyrocarpus asiaticus* contains various bio-active compounds like silyl steroidal-oxime, fluro-steroid, steroid, xanthin, steroidal ester, *etc*. Flurandrenolide exhibits antiinflammatory activity and anti-allergic activity. Difuro[2',3':5,6:3",2":7,8]perylo[1,12 def][1,3]dioxepin-8,15-dione, 10,11,12,13-tetrahydro-1,7-dihydroxy-10,13-dimethyl- and lanosta-7,9(11),20-triene-3á,18-

diol, diacetate have anticancer activity. Rhodoxanthin is useful in food preparation. Astaxanthin has an antioxidant activity and it may be beneficial in cardiovascular, immune, inflammatory and neurodegenerative diseases. The *Gyrocarpus asiaticus* Willd containing these compounds may serve as a potential source of bioactive compounds in the prevention or cure of various disorders.

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