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Short Communication

Chemical Composition of *Asparagus racemosus* Root by GC–MS Analysis

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Abstract

Asparagus racemosus (Asparagaceae) commonly called Shatavari in India is a well known plant for its effects on the female reproductive system and more often used to treat gastrointestinal disorders in Australia. The aim of the present study was to analyze the chemical composition of the roots of *Asparagus racemosus* by GC–MS method. The roots were washed, shade dried, powdered and stored in air tight container. The dried powdered material was extracted with hexane. 200g of powder was immersed in hexane solution in a flat bottom flask. The extract was concentrated under controlled pressure and temperature using rotary flash evaporator. The yield of the hexane extract was recorded as 14g. The GC–MS analysis of *Asparagus racemosus* roots hexane extract (AHE) showed the presence of 21 different chemical components such as Disulfide, bis(1-methylpropyl), Benzene, 1,3-bis(1,1 dimethylethyl), (E)-Hex-3-enyl (E)-2-methylbut-2-enoate, Jatamansone, n-Pentadecylcyclohexane, Eicosane, Squalene and Heptacosane.

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INTRODUCTION

Asparagus racemosus belongs to the family *Asparagaceae* and genus Asparagus. It is a common plant of ethnomedicine used to treat diabetes, gastric ulcers and to improve immunity (Sairam *et al*., 2003; Vadivelan *et al*., 2011; Sharma *et al*., 2011). The herb has been reported to treat anxiety disorders and to improve memory (Ojha *et al*., 2010). *A. racemosus* possesses bioactive metabolites such as glycosides, isoflavones, sapogenins, shatavarins, asparosides, fructo-oligosaccharides and fatty acids (Hayes *et al*., 2008; Thakur *et al*., 2012). The herb has been reported to modulate brain mono aminergic systems and hypothalamic-pituitary-adrenal axis and also inhibits acetylcholine activity (Meena *et al*., 2011; Krishnamurthy *et al*., 2013).

The rhizome is used as a food supplement and also in traditional medical applications. Its medicinal use has been reported in Indian traditional medicine such as Unani, Siddha and Ayurveda. *A. racemous* is widely reported as antioxidant (Kamat *et al*., 2000; Parihar *et al*., 2004), gastroprotective (Sairam *et al*., 2003), antitussive (Mandal *et al*., 2000), oestrogenic in pregnant rats (Pandey *et al*., 2005), neuroprotective (Meena *et al*., 2011), and to cure depression (Singh *et al*., 2006) , while anti-inflammatory activity was reported by Siddiq *et al*. (2011) and Sharma *et al*. (2011). LC-ESI-MS/MS analysis of *Asparagus racemosus* roots showed the presence of flavonoids, shatavarins and saponins. Effectiveness of *A. racemosus* extract in preventing (t-BHP) tert-Butyl hydroperoxide induced damage (Jayashree *et al*., 2015). The aim of the present study was to identify the bio active compounds of *Asparagus racemosus* root hexane fraction by GC–MS analysis.

MATERIALS AND METHODS

Chemicals and Reagents

The chemicals used were of high purity grade and were procured from Merck (Bangalore, India).

Plant Material

The roots of *Asparagus racemosus* were purchased from local market of Mysore, Karnataka, India and washed with water and shade dried for eight days till the moisture completely evaporates.

Preparation of Hexane Extract

The extract of *Asparagus racemosus* was prepared as described earlier (Jayashree *et al*., 2014). Briefly the shade dried roots were powdered and extracted with hexane, from about 400g of *Asparagus racemosus* root, 200g of powder was recovered and this was immersed in hexane solution in a 1000 ml flat bottom flask and was macerated for one week. The collected extracts were filtered and concentrated to dryness under reduced pressure and controlled temperature using rotary flash evaporator (Rotavac, Schwabach, Germany). The finial yield obtained was 14g.

Gas Chromatography and Mass Spectrometry (GC-MS) Analysis of the Hexane Fraction

The bioactive compounds present in the hexane fraction of *A. racemosus* (AHE) were identified by GC–MS using Agilent 7890 gas chromatograph (Agilent Technologies, Santa Clara, CA, US) coupled with LECO Corporation (St. Joseph, MI, USA) with the following conditions: the column used was 29.3 m × 320 µm; 0.7 m, 320 µm, capillary column −29.300 m, operating in an electron ionization mode at 70 eV; with helium as a carrier gas at a constant flow of 1.50 mL/min and an injection volume of 1.0 µL; injector temperature 250 °C; ion source temperature 200 °C. The oven temperature was initially 70 °C for 1 min, increased to 160 °C at a rate of 4 °C/min and increased finally to 320 °C for 15 min at a rate of 3°C/min and the total run time 3540.6 second. The mass spectrometer was operated at an acquisition rate of 10 spectra/s, and the scan range was set between 50 and 600 m/z. The detector voltage was set to 1450 V and the electron energy to −70 V.

RESULT AND DISCUSSION

GC-MS Analysis

The total ion chromatogram (TIC) of *Asparagus racemosus* root hexane fraction is shown in Figure 1. The chemical formula, mass, area and retention time of the identified compounds are listed in Table 1.

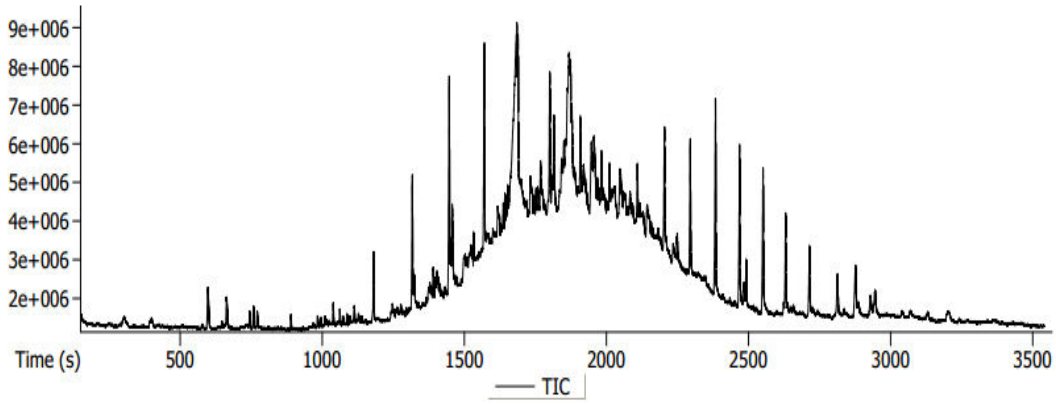

Figure 1: Total ion chromatogram (TIC) of *Asparagus racemosus* root hexane fraction

Table 1: Chemical composition of *Asparagus racemosus* root hexane fraction by GC–MS analysis

No.	RT (min)	Compound Name	Chemical Formula	Mass	Area	Hit
1	597.5	Disulfide, bis(1-methylpropyl)	$C_8H_{18}S_2$	178.0850	57783927	1
2	663.5	Benzene, 1,3-bis(1,1 dimethylethyl)-	$C_{14}H_{22}$	190.1722	10371095	1
3	1038.5	Hexadecane	$C_{16}H_{34}$	226.2661	18972039	2
4	1061.9	Phenol, 2,4-bis(1,1-dimethylethyl)-	$C_{14}H_{22}O$	206.1671	12588854	1
5	1317	Heptadecane	$C_{17}H_{36}$	240.2817	111806836	1
6	1447	Octadecane	$C_{18}H_{38}$	254.2974	192044330	1
7	1522	(E)-Hex-3-enyl (E)-2-methylbut-2-enoate	$C_{11}H_{18}O_2$	182.1307	3984267	1
8	1570.5	Nonadecane	$C_{19}H_{40}$	268.3130	192851012	1
9	1637.1	Nonadecane, 4-methyl-	$C_{20}H_{42}$	282.3287	23788864	1
10	1644.2	Phthalic acid, butyl tetradecyl ester	$C_{26}H_{42}O_4$	418.3083	13787025	1
11	1647.3	Jatamansone	$C_{15}H_{26}O$	222.1984	4511608	1
12	1752.5	Eicosane, 2-methyl-	$C_{21}H_{44}$	296.3443	19492959	1
13	1766.8	Cyclohexane, nonadecyl-	$C_{25}H_{50}$	350.3913	10561747	1
14	1794.9	Benzene, (1-methyltridecyl)-	$C_{20}H_{34}$	274.2661	3077231	1
15	1800.6	Heneicosane	$C_{21}H_{44}$	296.3443	123712383	3
16	1880.5	n-Pentadecylcyclohexane	$C_{21}H_{42}$	294.3287	9415214	1
17	1988.8	Cyclohexane, undecyl-	$C_{17}H_{34}$	238.2661	5641830	1
18	2109.2	Tetracosane	$C_{24}H_{50}$	338.3913	51131859	1
19	2204.3	Heptacosane	$C_{27}H_{56}$	380.4382	116877264	7
20	2491.8	Squalene	$C_{30}H_{50}$	410.3913	46964004	1
21	2813	Octadecane, 2-methyl-	$C_{19}H_{40}$	268.3130	54602668	1

Herbs have been used in traditional food system due their health benefits and nutritional value. *Asparagus racemosus* is a known food plant consumed in most parts of the world. It has gained a lot of significance in Indian traditional system of medicine. *A. racemosus* possesses an array of compounds that include flavonoids, polyphenols, oligosaccharides, amino acids (Negi *et al*., 2010); these compounds have been reported as radical scavengers due to their antioxidant activity (Rubio *et al*., 2013). In an earlier study (Jayashree *et al*., 2015) we have demonstrated the antioxidant and DNA damage protective effects of *A. Racemosus* in human colon cells (HT29) and mice muscle cells (C2C12). In the present study, we found that of hexane extract of *Asparagus*

racemosus roots, contains 21 different chemical components like Disulfide, bis(1-methylpropyl), Benzene, 1,3-bis(1,1 dimethylethyl), (E)-Hex-3-enyl (E)-2-methylbut-2-enoate, Jatamansone, n-Pentadecylcyclohexane, Eicosane, Squalene, Heptacosane which was listed in Table 1.

CONCLUSIONS

The present study was to evaluate the Chemical composition of Asparagus racemosus root hexane fraction by GC–MS method. The GC–MS analysis of *Asparagus racemosus* roots hexane extract showed the presence of 21 different chemical components such as Disulfide, bis(1-methylpropyl), Benzene, 1,3-bis(1,1 dimethylethyl), (E)-Hex-3-enyl (E)-2-methylbut-2-enoate, Jatamansone, n-Pentadecylcyclohexane, Eicosane, Squalene, Heptacosane and so on in hexane fraction of *Asparagus racemosus*.

Conflict of Interest

None declared.

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