

Screening of Phytochemical and GC-MS Analysis of some Bioactive constituents of *Asparagus racemosus*.

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Abstract: In the present study, the tubers of *Asparagus racemosus* were subjected to preliminary phytochemical and GC MS analysis. Preliminary phytochemical analysis revealed the presence of steroids, tannins, phenol, carbohydrates, cardiac glycosides, saponins and flavanoids. Xanthoprotein, terpenoids and quinones were not detected. GC MS analysis showed the presence of phytochemicals like 2- Furancarboxaldehyde, 1,2-Dithiolane-3-carboxylic acid [synonyms: Tetranorlipoic acid], 1,6-Anhydro- β -d-talopyranase, Tetradecanic acid, n-Hexadecanic acid, Oleic acid, 4 H Pyran- 4 One, 2,3 dihydro – 3,5 dihydroxy – 6 methyl and 9,12-Octadecadienoic acid.

Key Words: *Asparagus racemosus*, GC – MS and phytochemical analysis.

Introduction

Asparagus racemosus is a Wild variety. Belongs to the family Liliaceae, known as 'Shatavari'. The name Shatavari means "curer of a hundred diseases" (shat: "hundred" ; vari: "curer"). The herb is considered in Ayurveda as "queen of herbs". It has been highly regarded as a promoter of health and wellness (Michigan *Asparagus* Advisory Board¹. *Asparagus racemosus* is commonly referred as 'rasayana' in the Ayurveda². *Asparagus racemosus* is a well known Ayurvedic rasayana which prevent ageing, increase longevity, impart immunity, improve mental function, vigor and add vitality to the body and it is also used in nervous disorders, dyspepsia, tumors, inflammation, neuropathy, hepatopathy³. Reports indicate that the pharmacological activities of *Asparagus racemosus* root extract include antiulcer⁴, antidiarrhoeal, antidiabetic and immunomodulatory activities. Root of *A.racemosus* has been referred as bitter-sweet, emollient, cooling, nervine tonic, constipating, galactagogue, aphrodisiac, diuretic, rejuvenating, carminative, stomachic, antiseptic⁵ and as tonic. It also has anti-tussive, antibacterial activities⁶ and antioxidant⁷. The present study was undertaken to analyze the phytochemical properties and also to determine the possible chemical components from *Asparagus racemosus* by GC-MS technique.

Materials and Method

Collection of Plant Material

Asparagus racemosus (AR) tubers were collected from Namakkal. The wild roots were dried, powdered and stored at room temperature until use.

Phytochemical Screening

Chemical tests were carried out on the aqueous extract using standard procedures to identify the phyto constituents^{8,9}.

GC –MS Analysis

Preparation of extract

Tubers of *Asparagus racemosus* were shade dried. 20 g of the powdered tubers were soaked in 95% ethanol for 12 h. The extracts were then filtered through Whatmann filter paper No.41 along with 2 gm sodium sulfate to remove the sediments and traces of water in the filtrate. Before filtering, the filter paper along with sodium sulphate was wetted with 95% ethanol. The filtrate was then concentrated by bubbling nitrogen gas into the solution. The extract contained both polar and non-polar phytochemicals of the plant material used. 2 µl of these solutions was employed for GC/MS analysis¹⁰.

GC analysis

GC-MS analysis was carried out on a GC clarus 500 Perkin Elmer system comprising a AOC-20i autosampler and gas chromatograph interfaced to a mass spectrometer (GC-MS) instrument employing the following conditions: column Elite-1 fused silica capillary column (30 × 0.25 mm ID × 1EM df, composed of 100% Dimethyl poly siloxane), operating in electron impact mode at 70 eV; helium (99.999%) was used as carrier gas at a constant flow of 1ml/min and an injection volume of 0.5 EI was employed (split ratio of 10:1) injector temperature 250°C; ion-source temperature 280°C. The oven temperature was programmed from 110°C (isothermal for 2 min), with an increase of 10°C/min, to 200°C, then 5°C/min to 280°C, ending with a 9 min isothermal at 280°C. Mass spectra were taken at 70 eV; a scan interval of 0.5 s and fragments from 40 to 550 Da.

Identification of components

Interpretation on mass spectrum GC-MS was conducted using the database of National Institute Standard and Technology (NIST) having more than 62,000 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.

Result and Discussion

Phytochemical analysis revealed the presence of steroids, tannins, phenol, carbohydrates, cardiac glycosides, saponins and flavanoids. Xanthoprotein, terpenoids and quinones were not detected (Table 1). It was agreed with the previous investigations on methanolic extract of *Asparagus racemosus*¹¹. Alkaloid is a plant-derived compound that is toxic or physiologically active, contains nitrogen in a heterocyclic ring with complex structure and is of limited distribution in the plant kingdom. Alkaloids are formed as metabolic by-products and have been reported to be responsible for the antibacterial activity¹². Plants containing phenolic compounds, in particular flavonoids have been reported to possess strong antioxidant properties¹³. Glycosides serve as defense mechanisms against predation by many microorganisms, insects and herbivores¹⁴. Saponins have detergent properties and serve as lytic agents and exhibit anti-inflammatory properties¹⁵. The mechanism of action of these phytochemicals may be via lysing the cell, increasing permeability of the cell wall and membrane, inhibition of protein and DNA synthesis and or by inhibiting the transport of nutrients across the cell wall or membrane¹⁶.

Table 1: Phytochemical screening of *Asparagus racemosus*.

S.NO	Phytochemical Compounds	<i>Asparagus racemosus</i>
1.	Steroids	+
2.	Cardiac glycosides	+
3.	Phenols and tannins	+
4.	Carbohydrates	+
5.	Alkaloids	+
6.	Xanthoproteins	-
7.	Flavanoids	+
8.	Saponins	+
9.	Quinones	-
10.	Terpenoids	-

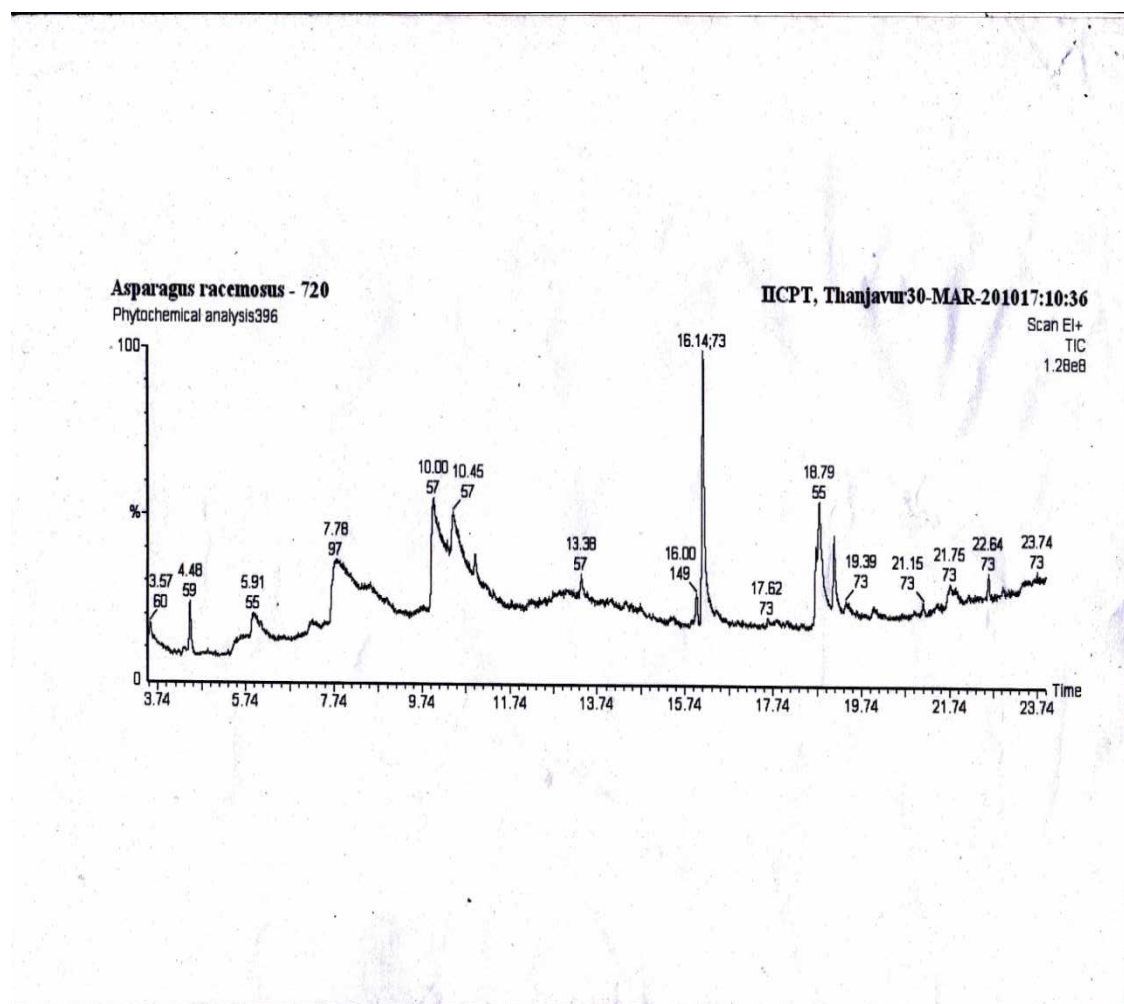
Figure1: Chromatogram of *Asparagus racemosus* by GC-MS.

Table 2: Phytochemicals identified in the ethanolic extract of the tubers of *Asparagus racemosus* by GC-MS.

NO	RT	Name of the compound	Molecular formula	MW	Peak area %
1	4.48	Propane, 1,1,3- triethoxy	C ₉ H ₂₀ O ₃	176	1.22
2	5.91	4H- Pyran-4-one, 2,3 dihydro-3,5-dihydroxy-6-methyl-	C ₆ H ₈ O ₄	144	2.61
3	7.78	2-Furancarboxaldehyde, 5-(hydroxymethyl)-	C ₆ H ₆ O ₃	126	39.49
4	10.00	1,2-Dithiolane-3-carboxylic acid [synonyms: Tetranorlipoic acid]	C ₄ H ₆ O ₂ S ₂	150	18.2
5	10.45	1,6-Anhydro-β-d-talopyranase	C ₆ H ₁₀ O ₅	162	14.03
6	10.95	Dodecanoic acid	C ₁₂ H ₂₄ O ₂	200	6.27
7	13.38	Tetradecanic acid	C ₁₄ H ₂₈ O ₂	228	2.21
8	16.14	n-Hexadecanic acid	C ₁₆ H ₃₂ O ₂	256	7.90
9	18.72	9,12- Octadecadienoic acid	C ₁₈ H ₃₂ O ₂	280	1.26
10	18.79	Octadecanoic acid	C ₁₈ H ₃₄ O ₂	282	5.07
11	19.13	Oleic acid	C ₁₈ H ₃₆ O ₂	284	1.70

Table 3. Activity of phyto-components identified in *Asparagus racemosus* (tubers) by GC-MS.

S.NO	Name of the Compound	Activity
1	2-Furancarboxaldehyde	Antimicrobial , Preservative
2	Tetradecanic acid	Anticancer, Antioxidant, Hypercholesterolemic, Lubricant, Nematicide.
3	n-Hexadecanic acid	Antioxidant, Hypercholesterolemic, Lubricant, Pesticide, Antiandrogenic, Flavor, Hemolytic 5 alpha reductase inhibitor, Nematicide.
4	9,12-Octadecadienoic acid	Anti inflammatory, Hypercholesterolemic, Nematicide, Cancer preventive, Hepatoprotective, Insectifuge, Antistaminic, Antiacne, 5 alpha reductase inhibitor, Antieczemic, Antiandrogenic, Anti coronary, Antiarthritic.
5	Oleic acid	Anti inflammatory, Antiandrogenic, Cancer preventive, Dermatitogenic, 5 alpha reductase inhibitor, Flavor, Insectifuge, Hypercholesterolemic, Aneniagenic.
6	4 H Pyran- 4 One, 2,3 dihydro – 3,5 dihydroxy – 6 methyl	Antimicrobial, Anti inflammatory.

Conclusion

Phytochemical analysis of *Asparagus racemosus* showed the presence of steroids, tannins, carbohydrates, alkaloids, cardiac glycosides and flavanoids. The GC-MS study also showed many Phytochemicals 2-Furancarboxaldehyde , 1,2-Dithiolane-3-carboxylic acid [synonyms: Tetranorlipoic acid], 1,6-Anhydro-β-d-

talopyranase, Tetradecanic acid, n-Hexadecanic acid, Oleic acid, 4 H Pyran- 4 One, 2,3 dihydro – 3,5 dihydroxy – 6 methyl and 9,12- Octadecadienoic acid which contributes the activities like antimicrobial, antioxidant anticancer, hypercholesterolemic, antiulcerogenic, lubricant, nematocide, anti inflammatory, antiandrogenic and other activities.

Acknowledgement

The authors thank very much Dr. K. Alagusundaram, Director, Indian Institute of Crop Processing Technology, Thanjavur for providing all the facilities and support used to carry out the work.

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