



GC-MS DETERMINATION OF BIOACTIVE CONSTITUENTS OF *CYCAS BEDDOMEI* CONES

N. RAVI KUMAR, J.SATYANARAYAN REDDY, G. GOPIKRISHNA, K.ANAND SOLOMON*

Department of Natural products, Sankarfoundation Research Institute Vishakapatnam,India

ABSTRACT

Cycas beddomei Dyer is one of the medicinally important plants belonging to the family Cycadaceae.

In the present study, the methanolic extract of the cones of *Cycas Beddomei* analyzed by GC-MS, while the mass spectra of the compounds found in the extract was matched with the National Institute of Standards and Technology (NIST) library. Twelve phytochemical constituents have been identified. The major chemical constituents are 1, 3-Propanediol, 2-(hydroxymethyl)-2-nitro (61.14%), Methyl tetradecanoate (4.77%), Hexadecanoic acid, methyl ester (9.00%) and Methyl cis-7-octadecenoate (4.73 %).

KEYWORDS: *Cycas Beddomei*, cones, methanolic extract, phytochemical constituents, GC-MS analysis.



K.ANAND SOLOMON

Department of Natural products, Sankarfoundation Research Institute
Vishakapatnam,India

INTRODUCTION

The genus *Cycas* (Cycadaceae) is rich in biflavonoids¹⁻² and some of the *Cycas* species are extensively used in traditional Indian medicine as stimulants, narcotics, in the treatment of malignant ulcers³. The biflavonoids are also known to possess antituberculosis⁴, antifungal⁵, antibacterial⁶, antiHIV⁷ and antimalarial⁸ activities. *Cycas beddomei* Dyer is a tall shrub endemic to the Tirumala Hills, Andhra Pradesh, India⁹. The objective of the present study is to identify the phytochemical constituents present in the cones of *Cycas beddomei* using GC-MS analysis.

EXPERIMENTAL

Collection of plant material

The cones of *cycas beddomei* were collected from the forest of Tirumala Hills, Chittoor district in the month of December, 2011 and were botanically identified by Dr. Madhav Chetty, Assistant Professor, Department of Botany, Sri Venkateswara University, Tirupathi.. A voucher specimen (No. SRI-1) has been preserved in the herbarium of Department of Natural Products, Sankar Foundation Research Institute, Visakhapatnam-530047, Andhra Pradesh, India.

Preparation of powder and extract

The cones of *cycas Beddomei* were shade-dried and powdered in a mechanical grinder. The powder (1kg) was extracted with petroleum ether followed by methanol at room temperature for 72h. The extracts were filtered and concentrated under reduced pressure in a rotary evaporator. The methanolic extract of the cones was used for GC-MS analysis.

GC-MS analysis

Preparation of extract

1µl of the methanolic extract of *Cycas Beddomei* cones was used for GC-MS analysis¹⁰.

Instruments and chromatographic Conditions

GC-MS analysis was carried out on GC-MS-QP2010 Shimadzu system comprising a gas chromatograph interfaced to a mass spectrometer (GC-MS) instrument employing the following conditions: column VF-5MS fused silica capillary column (30.0m x 0.25mm x 0.25 µm, composed of 5% phenyl/95% dimethylpolysiloxane), operating in electron impact mode at 70 eV; helium (99.999%) was used as carrier gas at a constant flow of 1.5ml/min and an injection volume of 1µl was employed (split ratio of 10:1), injector temperature was 240°C; ion-source temperature was 200°C. The oven temperature was programmed from 70°C (isothermal for 3 min), with an increase of 10°C/min, to 240°C, then 5°C/min to 300°C, ending with a 9 min isothermal at 300°C. Mass spectra were taken at 70 eV; a scan interval of 0.5 seconds and fragments from 40 to 440 Da. Total GC running time 35min.

Identification of components

Interpretation of 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.

RESULTS AND DISCUSSION

The compounds present in the methanolic extract of cones of *Cycas Beddomei* were identified by GC-MS analysis. The GC-MS chromatogram (Figure 1) showed 12 peaks indicating the presence of twelve phytochemical constituents. On comparison of the mass spectra of the constituents with the

NIST library the 12 phytoconstituents were characterized and identified, which are listed with their retention time (RT), molecular formula, molecular weight (MW) and concentration % in Table1. The major phytochemical constituents and their biological activities obtained through the GC-MS study of *Cycas Beddomei* are listed in Table2. Four major phytochemical constituent's mass spectra are presented in Figures 2, 3, 4 and 5.

They were identified as 1, 3-Propanediol, 2-(hydroxymethyl)-2-nitro (61.14%), Methyl tetradecanoate (4.77%), Hexadecanoic acid methyl ester (9.00%) and Methyl cis-7-octadecenoate (4.73 %) respectively. The biological activities listed are based on Dr. Dukes Phytochemical and Ethnobotanical Databases by Dr. Jim Duke of the Agricultural Research Service, USDA.

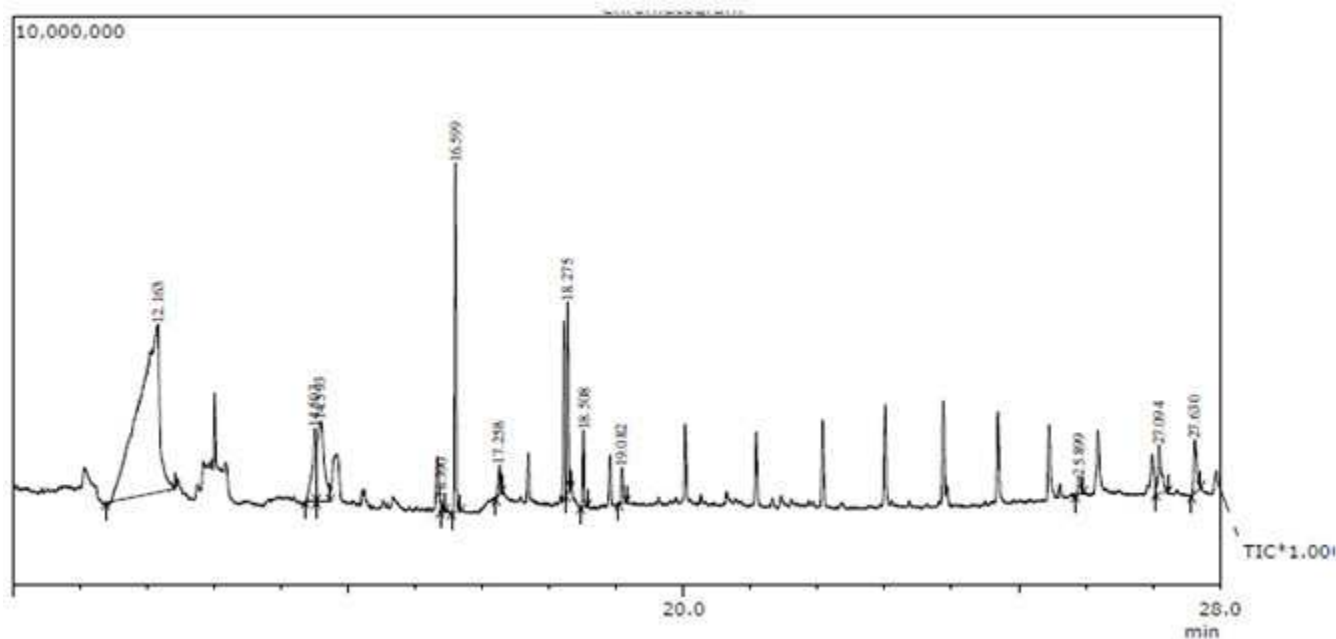


Figure.1
GC-MS chromatogram of the methanolic extract of the cones *Cycas Beddomei*.

Table 1
Phytoconstituents identified in methanolic extract of cones of *Cycas Beddomei* by GC-MS.

S.NO	RT	Name of the compound	Molecular formula	Molecular weight	Peak area %
1	12.163	1,3-Propanediol,2-(hydroxymethyl)-2-nitro	C ₄ H ₉ NO ₅	151	61.14
2	14.503	Methyl tetradecanoate	C ₁₅ H ₃₀ O ₂	242	4.77
3	14.593	Mome Inositol	C ₇ H ₁₄ O ₆	194	9.30
4	16.390	Methyl hexadec-9-enoate	C ₁₇ H ₃₂ O ₂	268	0.24
5	16.599	Hexadecanoic acid, methyl ester	C ₁₇ H ₃₄ O ₂	270	9.00
6	17.258	Hexadecanoic acid, ethyl ester	C ₁₈ H ₃₆ O ₂	284	1.08

7	18.275	Methyl cis-7-octadecenoate	C ₁₉ H ₃₆ O ₂	296	4.73
8	18.508	Stearic acid, methyl ester	C ₁₉ H ₃₈ O ₂	298	1.99
9	19.082	Tetradecanamide	C ₁₄ H ₂₉ NO	227	1.22
10	25.899	10-Nonadecanol	C ₁₉ H ₄₀ O	284	0.80
11	27.094	Cholest-4-en-3-one	C ₂₇ H ₄₄ O	384	2.91
12	27.630	gamma.-Sitosterol	C ₂₉ H ₅₀ O	414	2.82

Table 2
Biological activity of phytoconstituents identified in methanolic extract of cones of *Cycas Beddomei* by GC-MS.

S.NO	RT	Name of the compound	Molecular formula	Compound nature	**Activity
1	12.163	1,3-Propanediol,2-(hydroxymethyl)-2-nitro	C ₄ H ₉ NO ₅	Glycerol compound	Anticataract, Antiear-wax, Antiketotic, Antineuralgic, Arrhythmigenic, Emollient, Hyperglycemic
2	14.503	Methyl tetradecanoate	C ₁₅ H ₃₀ O ₂	Myristic acid ester	Antioxidant, Cancer-preventive, Hypercholesterolemic, Lubricant, Nematicide.
3	14.593	Mome Inositol	C ₇ H ₁₄ O ₆	Inositol	Antialopecic, Anticirrhotic, Antineuropathic, Cholesterolytic, Lipotropic, Sweetener.
4	16.390	Methyl hexadec-9-enoate	C ₁₇ H ₃₂ O ₂	Palmitic acid ester	Antialopecic, Antiandrogenic, Antifibrinolytic, Nematicide, Pesticide.
5	16.599	Hexadecanoic acid, methyl ester	C ₁₇ H ₃₄ O ₂	Palmitic acid ester	5-Alphareductase inhibitor, Hemolytic, Flavor, Antioxidant, Lubricant, Soap.
6	17.258	Hexadecanoic acid, ethyl ester	C ₁₈ H ₃₆ O ₂	Palmitic acid ester	Antioxidant, Hypocholesterolemic, Nematicide,

					Pesticide, Flavor, Lubricant, Antiandrogenic, 5-Alphareductase inhibitor.
7	18.275	Methyl cis-7- octadecenoate	$C_{19}H_{36}O_2$	Oleic acid ester	Anti-inflammatory, Antiandrogenic, Cancer preventive, Dermatitogenic, Hypocholesterolemic, Insecticide.
8	18.508	Stearic acid, methyl ester	$C_{19}H_{38}O_2$	Stearic acid	5-Alphareductase inhibitor, Cosmetic, Flavor, Hypocholesterolemic.
9	19.082	Tetradecanamide	$C_{14}H_{29}NO$	Myristic acid amide	Antioxidant, Cancer preventive, Nematicide.
10	25.899	10-Nonadecanol	$C_{19}H_{40}O$	Alcohol	Nematicide, Pesticide.
11	27.094	Cholest-4-en-3-one	$C_{27}H_{44}O$	Cholesterol	Antioxidant
12	27.630	gamma.-Sitosterol	$C_{29}H_{50}O$	Sterol	Antioxidant, Hypercholesterolemic

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

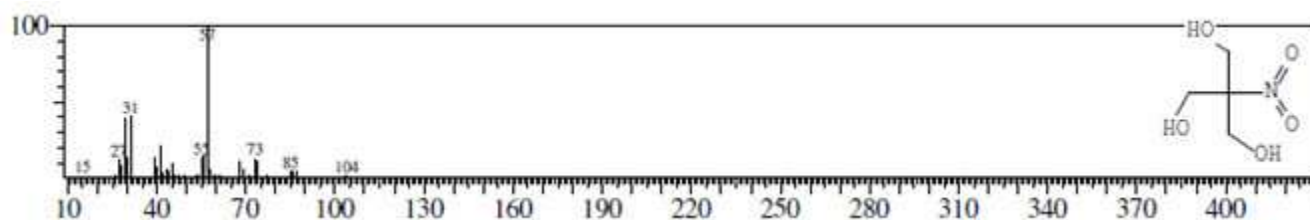


Figure.2
Mass spectrum of 1, 3-Propanediol, 2-(hydroxymethyl)-2-nitro (RT: 12.163)

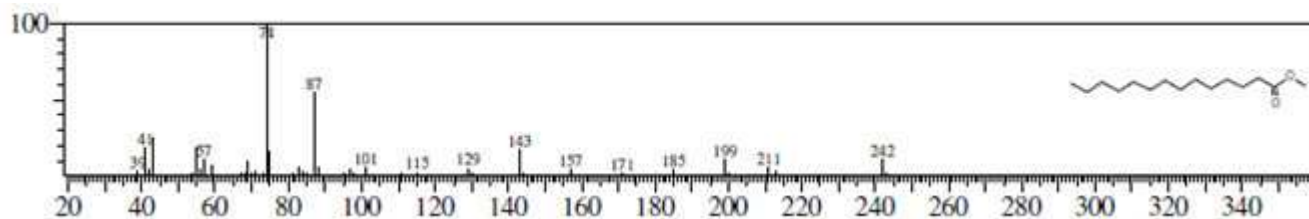


Figure.3
Mass spectrum of Methyl tetradecanoate (RT: 14.503)

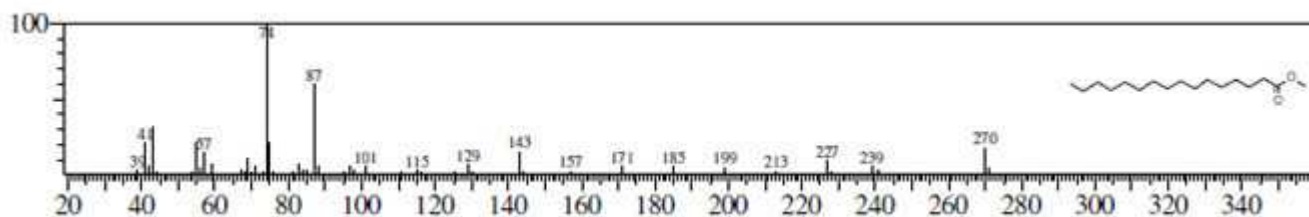


Figure.4
Mass spectrum of Hexadecanoic acid, methyl ester (RT: 16.599)

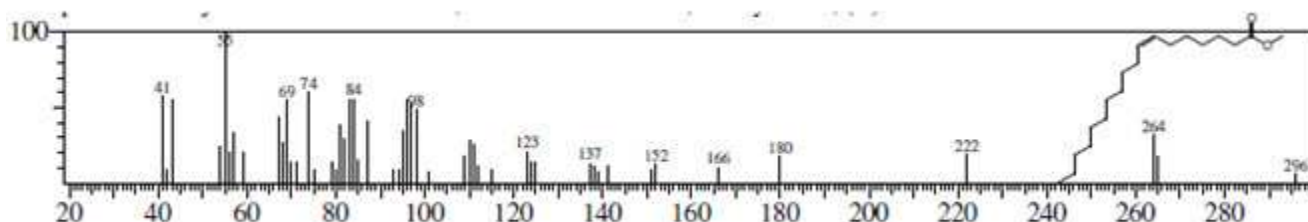


Figure.5
Mass spectrum of Methyl cis-7-octadecenoate (RT: 18.275)

CONCLUSION

In the present study twelve phytochemical constituents have been identified from methanolic extract of the cones of *Cycas Beddomei* by Gas Chromatogram- Mass spectrometry (GC-MS) analysis.

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