

GC-MS analysis of some bioactive constituents of *Pterocarpus marsupium* Roxb.

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Abstract: *Pterocarpus marsupium* Roxb. is one of the medicinally important plants belonging to the family Fabaceae, commonly known as “vengai” traditionally wood are used in the treatment of diabetes. In the present study the ethanol extract of wood and bark of *Pterocarpus marsupium* has been subjected to GC-MS analysis. Eight phytochemical constituents have been identified in wood and bark respectively. The major chemical constituents are 3-0-methyl-d-glucose, n-Hexadecanoic acid, 1,2-Benzene-dicarboxylic acid, diisooctyl ester, Tetradecanoic acid and 9,12 – Octadecadienoic acid (Z,Z) in wood. D-Friedoolean -14-en-3-one and lupeal were the major constituent bark.

Key words: GC-MS, *Pterocarpus marsupium*, 1,2-Benzenedicarboxylic acid, diisooctyl ester, Lupeol.

Introduction

Pterocarpus marsupium Roxb. (Leguminosae) is a large deciduous tree commonly found in hilly regions of India, especially in Deccan Peninsula. It is also distributed in Gujarat, Madhya Pradesh, Uttar Pradesh, Bihar, Orissa and Tamil Nadu. In different parts of India, it is one of the important drugs widely used in traditional Ayurvedic medicine for the treatment of diabetes mellitus. Administration of aqueous extract of *Pterocarpus marsupium* for fifteen days to mice lowered glucose absorption from the gastrointestinal tracts¹. The plant is also found to possess hypoglycemic action²⁻⁵, the wood of this plant used in treatment of diabetes⁶ and bark is used to regularize menstruation in teenage girls⁷. Extensive phytochemical studies have been carried out in the trunk but through phytochemical work have not been carried out in the wood and bark separately of this plant. Since there are no reports on the phytochemical aspects of wood and bark of *Pterocarpus marsupium*, it was chosen as the subject of this study. Hence the objective of the present study is to identify the

phytochemical constituents with the aid of GC-MS technique.

Materials and Methods

The wood and bark of *Pterocarpus marsupium* were collected from the Sirumalai hills, Western Ghats, Tamil Nadu. The wood and bark were air dried and powdered. Required quantity of powder was weighted and transferred to stopped 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 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 was carried out on a GC Clarus 500 Perkin Elmer system and gas chromatograph interfaced to a mass spectrometer (GC-

MS) instrument employing the following conditions: Column Elite-1 fused silica capillary column (30mmX0.25mm 1D X 1 μ Mdf, composed of 100% Dimethyl poly siloxane), operating in electron impact mode gas at a constant flow of 1ml/min and an injection volume of 2 μ l 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 9min. isothermal at 280°C. Mass spectra were taken at 70 eV; a scan interval of 0.5

seconds and fragments from 45 to 450 Da. Total GC running time was 36 min.

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.

Table.1. Phyto-Components identified in the ethanolic extracts of the bark of *Pterocarpus marsupium* by GC-MS

Sl.No.	RT	Name of the compound	Molecular Formula	MW	Peak Area %
1	12.66	3-O-Methyl-d-glucose	C ₇ H ₁₄ O ₆	194	10.97
2	16.38	n-Hexadecanoic acid	C ₁₆ H ₃₂ O ₂	256	4.42
3	16.70	Hexadecanoic acid, ethyl ester	C ₁₈ H ₃₆ O ₂	284	0.25
4	19.14	9,12-Octadecadienoic acid (Z,Z)-	C ₁₈ H ₃₂ O ₂	280	3.03
5	19.50	Octadecanoic acid	C ₁₈ H ₃₆ O ₂	284	0.84
6	25.40	1,2-Benzenedicarboxylic acid, diisooctyl ester	C ₂₄ H ₃₈ O ₄	390	6.96
7	29.77	D-Friedoolean-14-en-3-one	C ₃₀ H ₄₈ O	424	40.29
8	33.37	Lupeol	C ₃₀ H ₅₀ O	426	33.24

Table.2. Phyto-Components identified in the ethanol extracts of the wood of *Pterocarpus marsupium* by GC-MS

Sl.No.	RT	Name of the compound	Molecular Formula	MW	Peak Area %
1	12.77	3-O-Methyl-d-glucose	C ₇ H ₁₄ O ₆	194	73.31
2	13.47	Tetradecanoic acid	C ₁₄ H ₂₈ O ₂	228	3.47
3	15.49	Tricyclo[4.4.0.0(2,7)]dec-8-ene-3-methanol, $\alpha,\alpha,6,8$ -tetramethyl-, stereoisomer	C ₁₅ H ₂₄ O	220	1.51
4	16.11	Dibutyl phthalate	C ₁₆ H ₂₂ O ₄	278	1.14
5	16.24	n-Hexadecanoic acid	C ₁₆ H ₃₂ O ₂	256	9.19
6	18.82	9,12-Octadecadienoic acid (Z,Z)-	C ₁₈ H ₃₂ O ₂	280	2.49
7	19.24	Octadecanoic acid	C ₁₈ H ₃₆ O ₂	284	1.31
8	24.80	1,2-Benzenedicarboxylic acid, diisooctyl ester	C ₂₄ H ₃₈ O ₄	390	7.56

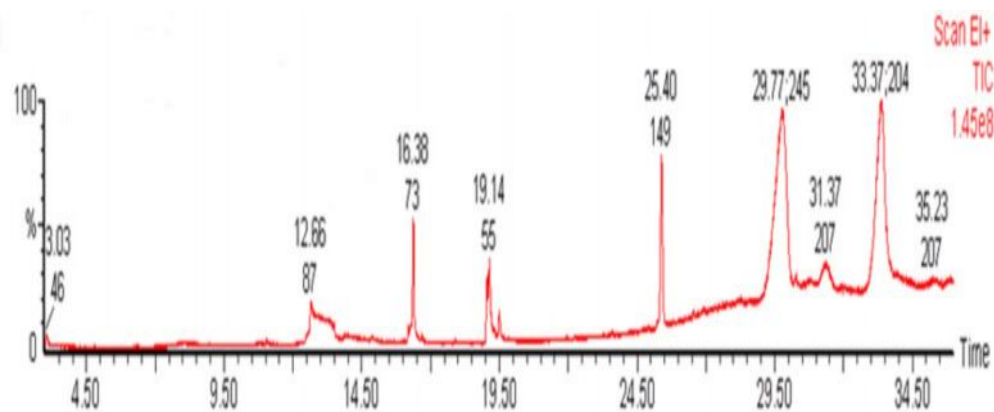


Fig. 1. GC-MS Chromatogram of the ethanolic extract of *Pterocarpus marsupium* bark

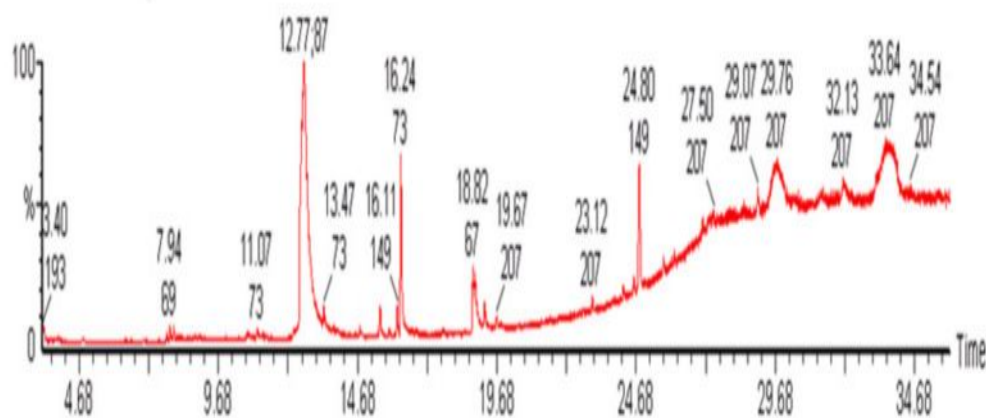


Fig. 2. GC-MS Chromatogram of the ethanolic extract of *Pterocarpus marsupium* wood

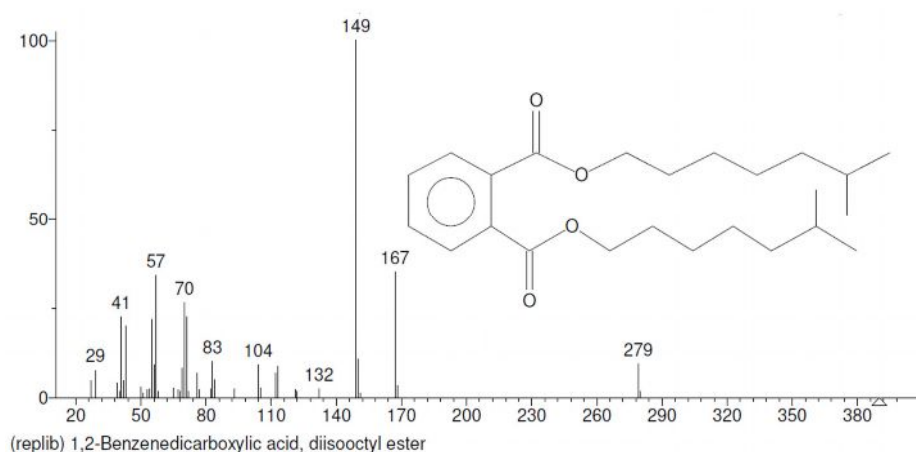


Fig. 3. Mass spectrum of 1,2-Benzenedicarboxylic acid, diisooctyl ester

Table.3. Activity of Phyto-Components identified in the ethanol extracts of the bark of *Pterocarpus marsupium* by GC-MS**** Dr.Duke's Phytochemical and Ethnobotanical Databases (Online Database)**

Sl.No.	Name of the compound	**Activity
1	3-O-Methyl-d-glucose	Preservative
2	n-Hexadecanoic acid	Antioxidant, Hypocholesterolemic Nematicide, Pesticide, Lubricant, Antiandrogenic, Flavor, Hemolytic 5-Alpha reductase inhibitor
3	Hexadecanoic acid, ethyl ester	Antioxidant, Hypocholesterolemic Nematicide, Pesticide, Lubricant, Antiandrogenic, Flavor, Hemolytic 5-Alpha reductase inhibitor
4	9,12-Octadecadienoic acid (Z,Z)-	Antiinflammatory, Hypocholesterolemic, Cancer preventive, Hepatoprotective, Nematicide, Insectifuge, Antihistaminic, Antieczemic, Antiacne, 5-Alpha reductase inhibitor Antiandrogenic, Antiarthritic, Anticoronary, Insectifuge
5	1,2-Benzenedicarboxylic acid, diisooctyl ester	Antimicrobial, Antifouling
6	Lupeol	Antibacterial, Antioxidant, Antitumor, Cancer preventive, Immunostimulant, Chemo preventive, Lipoxigenase- inhibitor, Pesticide

Table.4. Activity of Phyto-Components identified in the ethanol extracts of the bark of *Pterocarpus marsupium* by GC-MS**** Dr.Duke's Phytochemical and Ethnobotanical Databases (Online Database)**

Sl.No.	Name of the compound	**Activity
1	3-O-Methyl-d-glucose	Preservative
2	Tetradecanoic acid	Antioxidant, Cancer preventive, Nematicide, Lubricant Hypocholesterolemic
3	Dibutyl phthalate	Antimicrobial Antifouling
4	n-Hexadecanoic acid	Antioxidant, Hypocholesterolemic Nematicide, Pesticide, Lubricant, Antiandrogenic, Flavor, Hemolytic 5-Alpha reductase inhibitor
5	9,12-Octadecadienoic acid (Z,Z)-	Antiinflammatory, Hypocholesterolemic, Cancer preventive, Hepatoprotective, Nematicide, Insectifuge, Antihistaminic, Antieczemic, Antiacne, 5-Alpha reductase inhibitor Antiandrogenic, Antiarthritic, Anticoronary, Insectifuge
6	1,2-Benzenedicarboxylic acid, diisooctyl ester	Antimicrobial Antifouling

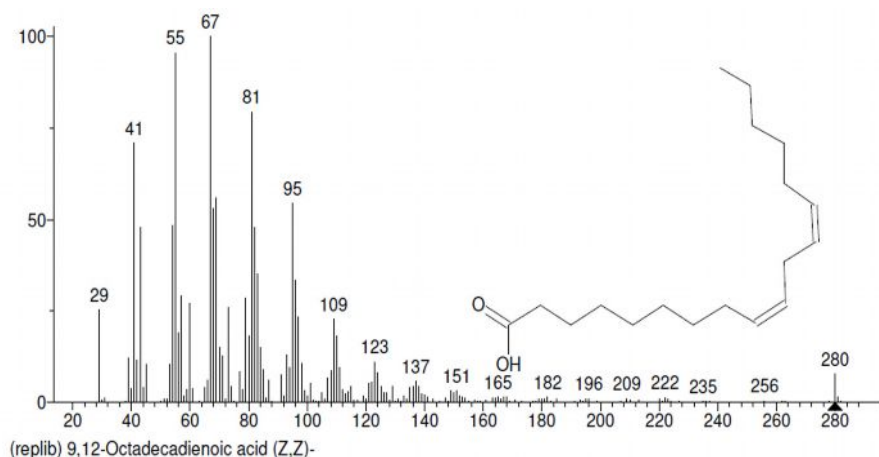


Fig. 4. Mass spectrum of 9,12-Octadecadienoic acid (Z,Z)-

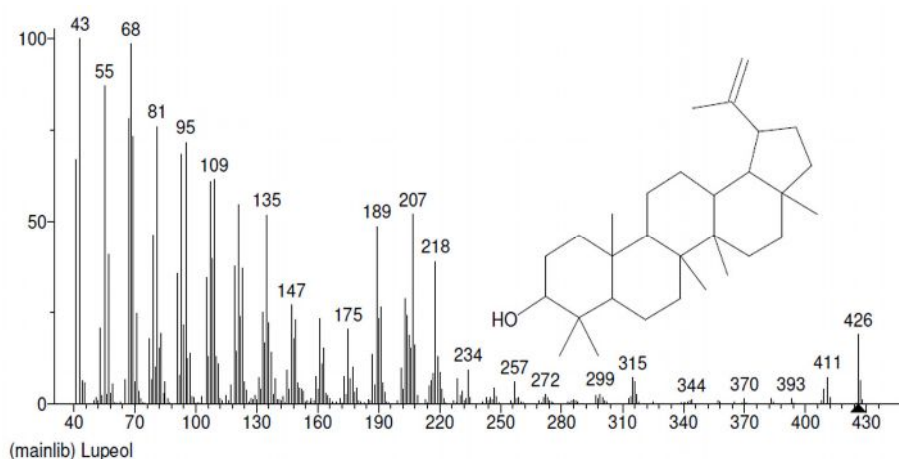


Fig. 5. Mass spectrum of Lupeol

Results and Discussion

The compounds present in the ethanol extracts of wood and bark of *Pterocarpus marsupium* were identified by GC-MS analysis (Figure 1 and 2). The active principles with their retention time (RT), molecular formula, molecular weight (MW) and concentration (%) in the ethanol extracts of wood and bark of *Pterocarpus marsupium* are presented in Table 1 and 2.

Eight compounds were detected in ethanol extracts of *Pterocarpus marsupium* wood and bark respectively. The compounds of the *Pterocarpus marsupium* wood extract was found to be 3-O-Methyl-d-glucose (73.31%), n-Hexadecanoic acid (9.19%), 1, 2-Benzenedicarboxylic acid, diisooctyl ester (7.56%), Tetradecanoic acid (3.47%) and 9, 12-Octadecadienoic acid (z, z)-(2.49%). In *Pterocarpus marsupium* bark, D-Friedoolean-14-en-3-one (40.29%) was the predominant constituent followed by Lupeol (33.24%),

3-O Methyl-d-glucose (10.97%), 1, 2-Benzene -dicarboxylic acid, diisooctyl ester (6.96%), n-Hexadecanoic acid (4.42%) and 9, 12-octadecadienoic acid (z,z)-(3.03%). Figure 3, 4 and 5 shows mass spectrum and structures of 1,2-Benzenedicarboxylic acid, diisooctyl ester, 9,12-octadecadienoic acid (Z,Z)- and Lupeol. Table 3 and 4 listed the major phytochemicals and its biological activities obtained through the GC-MS study of *Pterocarpus marsupium* wood and bark. The biological activities listed are based on Dr. Duke's phytochemical and ethnobotanical databases by Dr. Jim Duke of the Agricultural Research Service/USDA.

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