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Research Article

SEPARATION AND IDENTIFICATION OF HYDROCARBONS FROM *PTEROSPERMUM ACERIFOLIUM* LEAVES

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ABSTRACT

Pterospermum acerifolium (L) Willd (Family: Sterculiaceae) commonly known as 'Dinner plate tree' is a large deciduous tree widely distributed in North Canada and in many parts of India. The unsaponified petroleum ether extract of *P. acerifolium.* L. leaves has been analysed by gas chromatography-mass spectrometry (GC–MS) and was shown to consist of the saturated n-alkane homologues series (C18–C30). Tetracosane (12.97%), hexacosane (12.59%), octadecane (7.92%), nonacosane (3.99%) are the major saturated hydrocarbons whereas pentadecene (3.59) and hexadecene (1.47%) are the unsaturated hydrocarbons present in leaf petroleum ether extract of *P. acerifolium.* The total amount of hydrocarbons found in the unsaponified petroleum ether extract was 62.29%.

Keywords: *Pterospermum acerifolium*, GC-MS analysis, hydrocarbons.

INTRODUCTION

Pterospermum acerifolium (L) Willd (Family: Sterculiaceae) commonly known as 'Dinner plate tree' is a large deciduous tree widely distributed in North Canada and in many parts of India [1, 2]. In traditional system of medicine, the flowers are used as a general tonic, anti-tumor agent, analgesic and for the treatment of diabetes, gastrointestinal disorders, leprosy, blood troubles, bronchitis, cough, cephalic pain, migraine and inflammation. The bark contains Kaempferol, kaempferol-3-O-galactoside, luteolin-7-O-glucoside, luteolin-7-O-glucoronide, kaempferide-7-O-beta-D-glucopyranoside, D-galactouronic acid, D-galactose and L-rhamnose. Flowers contain 24-beta ethylcholest-5-in-3-beta-O-alpha-cellobioside, 3,7-dimethyl-7-methyl1:5pentacosanolide, n-hexacosan-1, 26-diol-dilignoserate, β-amyrine, β-sitosterol and a mixture of acids and saturated hydrocarbons. The seeds contain palmitic, stearic, arachidic, behenic, myristic, lignoceric, oleic, linoleic, linolenic acids. Trunk bark and seeds gave the amino acids tyrosin, cystine, glycine, alanine and leucine [3,4,5,6]

MATERIALS AND METHODS

Plant material

Leaves of *Pterospermum acerifolium* was collected from Nasik district of Maharashtra State (INDIA) and authenticated at Botanical Survey of India, Pune, where a sample (voucher number- RASPTA1) has been deposited.

Extraction

Shade-dried and powdered leaves were extracted with petroleum ether (60-80^{0}C). Solvent was evaporated at reduced pressure using rotary vacuum evaporator. The yield of the dried petroleum ether extract of leaves was found to be 10.2 % w/w. The extract was evaporated to a small volume and dried for 2 h with anhydrous magnesium sulphate.

Isolation

The unsaponified petroleum ether extract was taken for further study. The hydrocarbons were obtained by chromatography on silica gel (Merck, India) column. The silica gel was heated at 160^{0}C for 60 min, and then allowed to cool slightly. A 1 cm×30 cm column was prepared with slurry of silica gel in benzene. A 2 gm of unsaponified petroleum ether extract in benzene was applied and 30 fractions were collected in 15mL portions using benzene, chloroform as eluting solvent with different proportions. From eluted fractions, fraction number 7 -16 contains hydrocarbons, which was confirmed by TLC using benzene: chloroform (8 : 2) as developing solvent and visualisation was carried out by treatment with 50% sulphuric acid[7].

GC/MS Analysis

The extracted material was taken for GC-MS analysis. GC-MS [8,9,10] analysis was conducted using a Shimadzu QP 5050 mass spectrometer equipped with reference libraries using SE-52 (Mega, Legnano, Italy) cross-linked fused-silica capillary column coated with 5% phenyl polymethylsiloxane (25m×0.25mmi.d.×0.25 mm film thickness) under the following conditions: column temperature, 60^{0}C (8 min) to 180^{0}C at 3^{0}Cmin^{-1} to 230^{0}C at 20^{0}Cmin^{-1}; injector temperature, 250^{0}C; injection mode, split; split ratio, 1 : 40; volume injected, 0.2 mL of sample; carrier gas, helium, at 122.2 kPa (51.6 cm s^{-1}); interface temperature, 250^{0}C; and acquisition mass range, 40–400.

Identification and quantification

Hydrocarbons were identified by comparison of their linear retention indices with those from pure standard of those reported in literature. Comparison of fragmentation patterns in mass spectra with those in the stored database was also performed (McLafferty & Stauffer). The quantification of the components was performed on the basis of their GC peak areas[11].

Mass spectra

n-Pentadecene: 51(8.88), 55(100), 69(77.77), 83(77.77), 97(53.3), 111(48.88), 112(15.55), 125(15.55), 139(6.66), 153(6.66), 168(4.44), 179(4.44), 191(6.66), 209(4.44).

Hexadecene: 55(77.77), 69(84.44), 83(77.77), 97(100), 111(48.88), 125(48.88), 139(6.66), 155(8.88), 169(6.66), 178(4.44), 185(6.66), 208(4.44), 211(2.22), 225(4.44)

Octadecane : 55(2.4), 57(100), 71(77.77), 85(53.3), 99(20), 111(6.66), 113(6.66), 129(26.66), 155(4.44), 157(8.88), 185(4.44), 199(2.22), 213(11.11), 227(4.44), 256(13.33).

Nonadecane: 55(31.11), 57(100), 71(84.44), 85(48.88), 97(15.55), 113(6.66), 127(6.66), 141(2.22), 155(2.22), 182(4.44), 190(2.22), 239(2.22), 253(2.22), 269(2.22).

Eicosane: 55(28.88), 57(100), 71(82.22), 85(62.22), 99(17.77), 113(11.11), 127(6.66), 141(2.22), 155(2.22), 169(2.22), 183(4.44), 197(2.22), 211(2.22), 225(2.22), 239(2.22), 253(2.22), 267(2.22), 281(4.44).

n-Heneicosane: 55(40), 57(100), 71(62.22), 85(44.44), 99(13.33), 113(11.11), 127(8.88), 141(2.22), 155(2.22), 169(2.22), 183(2.22), 197(2.22), 225(2.22), 239(2.22), 267(2.22), 281(2.22), 296(4.44).

Docosane: 55(15.55), 57(100), 71(86.66), 85(57.77), 97(22.22), 127(8.88), 141(2.22), 155(6.66), 197(6.66), 225(4.44), 239(4.44), 281(2.22), 296(2.22), 310(2.22).

Tetracosane:55(28.88), 57(100), 71(75.55), 85(57.77), 97(13.33), 111(11.11), 127(6.66), 141(6.66), 155(2.22), 183(2.22), 197(2.22), 211(2.22), 225(2.22), 239(2.22), 253(2.22), 281(2.22), 295(2.22), 309(2.22), 323(2.22), 337(2.22).

Pentacosane: 55(40), 57(100), 71(73.33), 85(40), 97(17.77), 99(13.33), 113(8.88), 141(8.88), 169(4.44), 208(4.44), 225(4.44), 241(2.22), 269(2.22), 281(2.22), 309(2.22), 323(2.22), 337(2.22), 352(2.22).

Hexacosane: 55(40), 57(100), 71(73.33), 85(40), 97(17.77), 99(13.33), 113(8.88), 141(8.88), 169(4.44), 208(4.44), 225(4.44), 241(2.22), 269(2.22), 283(2.22), 309(2.22), 323(2.22), 337(2.22), 352(2.22), 365(2.22).

Heptacosane: 55(24.44), 57(100), 71(77.77), 85(55.55), 97(22.22), 99(22.22), 113(11.11), 141(4.44), 169(2.22), 192(2.22), 225(2.22), 253(2.22), 281(2.22), 295(2.22), 309(2.22), 365(2.22), 380(2.22).

Octacosane: 57(100), 71(62.22), 85(62.22), 97(24.44), 99(24.44), 113(22.22), 117(11.11), 141(8.88), 169(8.88), 192(4.44), 225(4.44), 253(2.22), 276(2.22), 281(2.22), 309(2.22), 365(2.22), 381(2.22), 394(2.22).

Nonacosane: 57(100), 70(31.11), 83(73.33), 97(51.11), 104(31.11), 113(31.11), 127(26.66), 141(17.77), 155(20), 169(31.11), 197(15.55), 211(15.55), 229(15.55), 253(11.11), 281(13.33), 365(2.22), 381(2.22), 395(2.22), 408(2.22).

Triontane: 57(100), 71(62.22), 85(44.44), 99(20), 113(6.66), 127(6.66), 141(8.88), 155(8.88), 169(6.66), 225(2.22), 255(2.22), 281(2.22), 295(2.22), 309(2.22), 365(2.22), 408(2.22), 4.22(2.22).

RESULTS AND DISCUSSION

Table 1 shows the identified compounds and their percentages, molecular formula and molecular weight as well as the Rt values listed in order of their elution from the SE-52 capillary column. The total fourteen hydrocarbons were identified in leaves. The GC-MS spectrum detected the presence of more long chain hydrocarbons. The unsaponified petroleum ether extract when fractionated using silica gel as adsorbent and various proportion of benzene, chloroform as eluent was separated various saturated hydrocarbons (57.53%) and unsaturated hydrocarbons (5.06%).

Table 1: Percent composition of the hydrocarbons of an unsaponified petroleum ether extract of *P. acerifolium* leaves.

Sr. no.	Rt	Name of compound	Molecular formula	Molecular weight	Peak area (%)
1	15.55	Pentadecene	$C_{15}H_{30}$	210	3.59
2	17.00	Hexadecene	$C_{16}H_{32}$	224	1.47
3	18.00	Octadecane	$C_{18}H_{38}$	254	7.92
4	18.53	Nonadecane	$C_{19}H_{40}$	268	2.04
5	19.12	Eicosane	$C_{20}H_{42}$	282	2.65
6	19.81	n-Heneicosane	$C_{21}H_{44}$	296	2.68
7	20.68	Docosane	$C_{22}H_{46}$	310	2.42
8	21.49	Tetracosane	$C_{24}H_{50}$	338	12.97
9	22.44	Pentacosane	$C_{25}H_{52}$	352	3.84
10	23.03	Hexacosane	$C_{26}H_{54}$	366	12.58
11	23.76	Heptacosane	$C_{27}H_{56}$	380	2.2
12	23.94	Octacosane	$C_{28}H_{58}$	394	.58
13	24.29	Nonacosane	$C_{29}H_{60}$	408	3.99
14	25.72	Triacontane	$C_{30}H_{62}$	422	3.36
Total					62.29

Note: Hydrocarbons are reported according to their elution order on SE-52.

CONCLUSION

After GC-MS analysis of petroleum ether extract of leaves of *Pterospermum acerifolium,* showed presence of fourteen hydrocarbons which were proved for their exact structure by comparing it with standard GC-MS data of the reported hydrocarbons.

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