GC-MS analysis of biomolecules on the leaves extract of *Sterculia urens* Roxb

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Abstract

The present study of phytochemical analysis in the leaf powder extract with methanol, the phytochemical compound screened by GC-MS method. In this GC-MS analysis, 27 bioactive phytochemical compounds were identified in leaf powder of *Sterculia urens*. These different active phytochemicals have been found to possess a wide range of activities, which may help in the protection against incurable diseases.

Keywords: GC-MS, Medicinal Plants, Phytol, Phytochemicals, *Sterculia urens*

1. Introduction

The chemical compound 3, 7, 11, 15-Tetramethyl-2-hexadecen-1-ol also known as phytol was the highest chemical constituent analysed. It had a peak area of 37.78%. It is an acyclic diterpene alcohol that can be used as a precursor for the manufacture of synthetic forms of vitamin E and vitamin K1 [1, 2]. Phytol is used in the fragrance industry and in cosmetics, shampoos, toilet soaps, household cleaners and detergents [3, 4]. Phytol uses may also include increasing energy and fighting infection and are natural alternatives to use for hypertension and cancer [1, 2, 3]. Phytol has been reported to have anti-mycobacterial activity against *mycobacterium tuberculosis* [2, 5]. The high quantity of phytol in the leaf of *S. urens* suggests that the plant might be used in the treatment of tuberculosis. The medicinal plants appear to be rich in phytoconstituents, widely used in conventional medicine to combat and cure various diseases. The anti-inflammatory, anti-diabetic, antibacterial, anticancer, antioxidant, antispasmodic, analgesic and diuretic can be attributed to their high level of Phytoconstituents.

**Sterculiaceae** is a botanical name for a group of flowering plants at the rank of family and, as is true for any botanical name, the circumscription, status and placement of the taxon varies with taxonomic point of view. The family name is based on genus Sterculia. As traditionally circumscribed the Sterculiaceae, Malvaceae, Bombacaceae and Tiliaceae comprise the “core Malvales” of the Cronquist system and the close relationship among these families is generally recognized [6]. *Sterculia urens* is a moderate sized tree belonging to the family Sterculiaceae. It is commonly known as ‘gum karaya tree’ and it is valued for its gum known as ‘Indian tragacanth’. In India, *S.urens* is used to treat fistula, rhagades, with the indigenous use which is known as sandal. It is used as an ingredient in the preparation of emulsions, lotions, denture fixative powders and bulk laxatives [7].

It has a wide application in food, baking and dairy industries. The gum is a complex polysaccharide. The gum is in great demand both within and outside India. Considerable part of the gum produced in India is exported. Tapping of the gum requires stripping of the bark. As the tree is easily injured, indiscriminate tapping of young tree impairs their viability. Unscientific tapping methods, poor seed viability and meager distribution of this tree are limitations for the availability of the gum. In spite of the rich commercial importance, it grows only as a wild forest plant and is enlisted as an endangered plant species. The aim of the present study is to identify the active biomolecules of this plant and subjecting the methanol extract of the plant leaves to Gas chromatography – Mass Spectrum analysis.

2. Materials and Methods

2.1. Collection of plant material

The leaves of *Sterculia urens* were collected from the Pachamalai, Eastern Ghats of Tamilnadu, South India. The hill is situated 2000 to 3000 feet above mean sea level and lies between 78.31° East and 11.28’North latitude. They were identified and authenticated by the Rabinat Herbarium (Ref No. SJCBOT 2086), St. Joseph’s College, Tiruchirappalli, Tamilnadu, India.
2.2. Preparation of powder and extract
Leaves of *Sterculia urens* (5 g) was shade dried, powdered and extracted with methanol for 24 hours using cold maceration methods (Advantages: 1. The drug is extracted as many times as there are receivers – in this case, three. If more extraction stages are required, it is only necessary to have more receivers. 2. The last treatment of the drug before it is discharged is with fresh solvent, giving maximum extraction. 3. The solution is in contact with fresh drug before removal for evaporation, giving the highest possible concentration). The extract was then filtered through Whatman filter paper No. 1 along with 2 g sodium sulfate to remove the sediments and traces of water in the filtrate. Before filtering, the filter paper along with sodium sulphate is wetted with absolute alcohol. The filtrate is then concentrated by bubbling nitrogen gas into the solution and reduce the volume to 1ml. The extract contains both polar and non-polar phyto components.

2.3. GC-MS Analysis
The GC-MS analysis of *Sterculia urens* powder leaves extract with in methanol, was performed using a Clarus 500 Perkin Elmer gas chromatography equipped with a Elite-5 capillary column (5% phenyl 95% dimethyl polysiloxane) (30 nm X 0.25 mm ID X 0.25 μmdf) and mass detector turbomass gold of the company which was operated in EI mode. Helium was the carriers gas at a flow rate of 1ml/min. and the injector was operated at 290 ºC and the oven temperature was programmed as follows; 50 ºC at 8 ºC/min to 200 ºC (5 min) at 7 ºC/min to 290 ºC (10 min).

2.4. Identification of components
Interpretation on mass spectrum of GC-MS was done using the database of National Institute Standard and Technology (NIST), having more than 62,000 patterns. The mass 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 [8, 9].

3. Results and Discussion
The GC-MS analysis of *S. urens* leaves revealed the presence of twenty seven compounds (phytochemical constituents) that could contribute the medicinal quality of the plant. The identification of the phytochemical compounds was confirmed based on the peak area, retention time and molecular formula. The active principles with their Retention time (RT), Molecular formula, Molecular weight (MW) and peak area in percentage are presented in Table 1. The major compounds present in the leaves were 3, 7, 11, 15-Tetramethyl-2-hexadecen-1-ol (21.34%), sucrose (11.49%), 2, 4-Dihydroxy-2, 5-dimethyl-3(2H)-furan-3-one (8.10%), 5(2H)-Oxazolone, 4-(phenylmethyl)- (6.97%), 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- (6.78%), Megastigmatrienone (5.93%) and 2-Methoxy-4-vinylphenol (5.27%) etc., other major and minor compounds were also present (Table 1).
<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Formula</th>
<th>MW:</th>
<th>LogP:</th>
<th>MW:</th>
</tr>
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<tr>
<td>6.</td>
<td>3-Hexen-2-one, 3,4-dimethyl-</td>
<td>C8H14O</td>
<td>128</td>
<td>9.25</td>
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<td>7.</td>
<td>4H-Pyran-4-one, 2,3-dihydro-5,6-dihydroxy-6-methyl-</td>
<td>C6H8O4</td>
<td>144</td>
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<td>8.</td>
<td>Benzo furan, 2,3-dihydro-</td>
<td>C8H8O</td>
<td>120</td>
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<td>9.</td>
<td>2-Methoxy-4-vinylphenol</td>
<td>C9H10O2</td>
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<td>10.</td>
<td>Phenol, 2,6-dimethoxy-</td>
<td>C8H10O3</td>
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<td>11.</td>
<td>à-D-Glucopyranosiduronamide, methyl 2,3-di-O-methyl-</td>
<td>C9H17NO6</td>
<td>235</td>
<td>14.69</td>
<td>186645</td>
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<td>12.</td>
<td>Benzene, 1-[(dimethoxymethyl)-1-ethyl]-4-methoxycarbonyl-1-ethyl-</td>
<td>C15H22O4</td>
<td>266</td>
<td>14.88</td>
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<td>13.</td>
<td>Sucrose</td>
<td>C12H22O11</td>
<td>342</td>
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<td>14.</td>
<td>1,6-Anhydro-à-D-glucopyranose (levoglucosan)</td>
<td>C6H10O5</td>
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<td>3',5'-Dimethoxyacetophenone</td>
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<td>16.</td>
<td>Ethanol, 2-[4-(1,1-dimethyllethyl)-2-methylphenoxy]-</td>
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<td>Megastigmatrienone</td>
<td>C13H18O</td>
<td>190</td>
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<td>18.</td>
<td>4,4,5,8-Tetramethylchroman-2-ol</td>
<td>C13H18O2</td>
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<td>19.</td>
<td>1-Cyclohexene-1-propanal</td>
<td>C12H20O</td>
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<td>Benzene, 1-methoxy-2-[(4-methoxyphenyl)methyl]-</td>
<td>C15H16O2</td>
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<td>21.</td>
<td>3,7,11,15-Tetramethyl-2-hexadecen-1-ol</td>
<td>C20H400</td>
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<td>Acetamide, N-(4-ethoxy-3-hydroxyphenyl)-</td>
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<td>n-Hexadecanoic acid</td>
<td>C16H32O2</td>
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<tr>
<td>24.</td>
<td>Phytol</td>
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<td>25.</td>
<td>5(2H)-Oxazolone, 4-(phenylmethyl)-</td>
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<td>26.</td>
<td>1-Propanamine, 3-dibenzo[b,e]oxepin-11(6H)-ylidene-N,N-dimethyl-</td>
<td>C19H21NO2</td>
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<td>27.</td>
<td>Squalene</td>
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</table>
Phytol is one among the 27 compounds from the leaves of *S. urens*. Presence of Phytol in the leaves of *Kirganelia reticulata* aerial parts, which was also found to be effective in different stages of arthritis. Abirami and Rajendran reported that this compound present in *Vernonia cinerea* added medicinal properties to this species despite the presence of eight other chemical compounds. The other major compound reported in the study species, *Hildegardia populifolia*, 1-Benzazirene-1-carboxylic acid, 2, 2, 5-trimethyl-1a-[3-oxo-1-butenyl] ethydro-methyl ester is a fatty acid compound. Kale et al. also identified major fatty acid compounds in Sterculiae member, *Sterculia foetida* through GC-MS analysis.

In the present study, GC-MS analysis of plant species has established the twenty seven bioactive components which may possess several pharmacological properties. Similar to this study, five major compounds were characterized through GC-MS analysis in *Polygonum chinense* seventeen compounds were characterized from methanolic extract of *Cassia italica* leaf seed fourteen compounds were identified from ethanolic extract of *Entada pursaetha* by GC-MS analysis fourteen compounds were identified from *Caralluma fimbriata* through Phytochemical studies and GC-MS analysis. The presence of various bioactive compounds in the *P. chinense* justifies the use of leaves for various ailments by traditional practitioners. However, isolation of individual phytochemical constituents and subjecting it to the biological activity will definitely give fruitful results. From the results, it could be concluded that *S. urens* contains various bioactive compounds. Therefore, it is recommended as a plant of phytopharmaceutical importance.

4. References