Phytochemical Profiling And GC-MS Study Of Antigonum leptopus Hook & ARN.

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Abstract: The present study investigated the chemical constituents of a traditionally used ethanobotanical plant Antigonum leptopus using a GC-MS approach. Phytochemical analysis of Antigonum leptopus revealed the presence of alkaloids, saponium, steroid, phenolic compounds, fatty acids, flavonoids and volatile oils in leaves and tubers. Interestingly, ten phytochemical constituents were analyzed and characterized by GC-MS that confirmed the presence of (1) Glycerin (2.49%), (2) Propane,1,1,3-triethoxy (4.09%), (3) 4H-pyran-4-one,2,3-dihydro-3,5-dihydroxy-6-methyl- (14.34%), (4) methyl salicylate (1.14%), (5) 2-furancarboxaldehyde,5-(hydroxymethyl) (24.45%), (6) dodecanoic acid (1.89%), (7) 1,2-Benzenedicarboxylic acid, bis(2-methylpropyl)ester (6.06%), (8) n-hexadianoic acid (15.20%), (9) oleic acid (18.02%) and (10) 1,2-Benzenedicarboxylic acid, diisooctyl ester (12.33%). Results from this work indicated useful information on the phytochemistry of A. leptopus tuber, which can pave way to further applications and utility in the pharmaceutical and nutraceutical field.

Keywords: Antigonum leptopus, GC-MS, Phytochemical component.

Introduction

According to World health organization, medicinal plants would be the best source to obtain a variety of drugs. About 80% of individuals from developed countries use traditional medicine, which has been derived from medicinal plants. The medicinal plants are of great important to the health of individual and communities. The medicinal value of these plants lie in some active chemical substances called phytochemical that produce a physiological action on the human body. Phytochemicals are naturally occurring biochemical compounds in plants for color, flavor, smell and texture for pollination and define mechanism. Some plant secondary metabolites such as alkaloids, phenols, tannins, glycosides, terpenoids, saponins, flavonoids and steroids have been implicated in their ability to inhibit the formation of pro-inflammatory signaling molecules such as prostaglandin or leukotrienes¹.

However, such plants should be investigated to better understand their properties, safety and efficiency². The herbal plant Antigonum leptopus are widely used by the tribal people as an efficient medicine that cures piles. Therefore, this study is conducted to provide a thorough knowledge on the tribal plant A. leptopus. Studies based on the ethnobotanical use of plants have often provided a more efficient method of drug discovery than random screening¹. In the present study, we evaluated phytochemical screening of leaf and tuber of A.
leptopus on the quantitative and qualitative analysis by using the GC-MS method for the identification of compounds and their activity based on ethanobotanical databases.

Materials and methods

Plant material

The plant materials such as leaves and tubers were collected from the college outskirt region of the campus of H.H. The Rajah’s College, Pudukottai, a distinct headquarters of Tamilnadu state. The vegetative parts, leaves and tubers from A. leptopus, belonging to the family Polygonaceae was employed for the analysis. Herbarium specimens of the plant parts were prepared and deposited as voucher specimens in the departmental herbarium for future verification. The fresh leaves and tuber were dried thoroughly under shade and powdered finely and stored in a clean plastic container for phytochemical analysis.

Phytochemical estimation

The phytochemical estimation from fresh leaves and tuber powder of A. leptopus were quantitatively determined by adopting standard protocols viz., Chlorophyll\(^5\), carotenoid\(^6\), total soluble sugars\(^7\) and total soluble starch\(^8\) using glucose as standard, total soluble proteins\(^9\) by using bovine serum albumin as standard, total free amino acids\(^10\) using leucine as standard, total phenols\(^11\) using catechol as standard, hydroxy phenols\(^12\) using catechol as standard. All experiments were repeated three times for precision and values were expressed in mean ± standard deviation in terms of fresh leaves and air dried tuber.

Preparation of plant extracts

Twenty gram of tuber powder was soaked in 50 ml of absolute alcohol overnight for alcoholic extraction. It was filtered through Whatmann filter paper No. 41 along with 2gm sodium sulfate which had been wetted with absolute alcohol to remove the sediments and traces of water in the filtrate. Then the filtrates were concentrated by bubbling nitrogen gas into the solution and reduce the volume to 1 ml. The extract contained both polar and non-polar phytochemical components.

GC-MS analysis

The plant sample (tuber extract) was analyzed in a Perkin Elmer GC Clarus 500 MS system for different components present in the extract, under the following conditions: column– dimethyl polysiloxane DB-1 fused silica capillary column (30m x 0.25 mm x 0.1µm of film thickness); carrier gas – helium (1ml / min); injector temperature –250\(^o\)C; detector temperature - 200\(^o\)C; column temperature – 35-180\(^o\)C at 4\(^o\)C / min – then 180 – 250\(^o\)C at 10\(^o\)C / min; MS electron impact 70\(_e\)V.

Identification of compound

Interpretation on mass spectrum of GC-MS was conducted using the database of National Institute Standard and Technology (NIST Ver.2.1) 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 identified. The activity of the tuber extract of biochemical compound was compared with Dr. Duke's Phytochemical and Ethnobotanical Databases.

Results

The present study carried out on the plant samples revealed the presence of medicinally active constituents. Quantitative estimation of the biochemical compounds of the plant parts such as leaf and tuber was studied and summarized in Table 1. The content of pigments like total chlorophyll (1.452± 0.06), chlorophyll a (0.772± 0.33), chlorophyll b (0.681± 0.02), and carotenoid (0.632± 0.05) in leaves and the components like total soluble sugars (312.31±12.76), total soluble starch (107.12±3.5), total soluble proteins (31.21±1.04) and free amino acids (76.32±4.49) as well as phenols (42.41±2.34) and total hydroxyphenols (156.13±5.73) in tubers was comparatively higher than that of leaves.

The presence of secondary metabolites in the leaf and tuber of the A. leptopus investigated were summarized in Table 2. The results show that the presence of saponin, steroid / triterpenoid, phenolic compounds, fatty acid, flavonoids and volatile oils were present in leaf and tuber of the plant. Tannins and glycosides were absent in leaf and tuber respectively, whereas alkaloids were present in the tuber.
Table 1. Basic biochemical components in leaves and tubers of *Antigonum leptopus* Hook.&Arn.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Basic biochemical components</th>
<th>Leaf (mg g⁻¹ f.w.)</th>
<th>Tuber (mg g⁻¹ d.w.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chl. <em>a</em></td>
<td>0.772± 0.33</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Chl. <em>b</em></td>
<td>0.681± 0.02</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Total chl.</td>
<td>1.452± 0.06</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Carotenoids</td>
<td>0.632± 0.05</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Total soluble sugar</td>
<td>47.72± 2.49</td>
<td>312.31± 12.76</td>
</tr>
<tr>
<td>4</td>
<td>Total soluble starch</td>
<td>42.51± 2.54</td>
<td>107.12± 3.5</td>
</tr>
<tr>
<td>5</td>
<td>Total soluble proteins</td>
<td>13.83± 0.65</td>
<td>31.21± 1.04</td>
</tr>
<tr>
<td>6</td>
<td>Total free amino acids</td>
<td>18.22± 4.71</td>
<td>76.32± 4.49</td>
</tr>
<tr>
<td>7</td>
<td>Total phenols</td>
<td>20.32± 1.29</td>
<td>42.41± 2.34</td>
</tr>
<tr>
<td>8</td>
<td>Hydroxy phenols</td>
<td>20.71± 1.43</td>
<td>156.13± 5.73</td>
</tr>
</tbody>
</table>

Table 2. Qualitative analysis of phytochemicals from *Antigonum leptopus* Hook. & Arn.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the compounds</th>
<th>Plant parts</th>
<th>Leaf</th>
<th>Tuber</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alkaloids</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Tannin</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Saponin</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Triterpenoid</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Phenolic compounds</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Fatty acid</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Flavonoids</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>8</td>
<td>Glycoside</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>9</td>
<td>Volatile oils</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

+ = Presence of constituent  
- = Absence of constituent

GC-MS chromatogram of the alcoholic extract of *A. leptopus* showed ten peaks indicating the presence of ten compounds. The chemical compounds and their activity in the alcoholic extract of *A. leptopus* are presented in Table 3, 4 and Figure 1. The ten phytochemical constituents characterized by GC-MS peak are as follows: (1) Glycerin (2.49%), (2) Propane, 1,1,3-triethoxy (4.09%), (3) 4H-pyran-4-one,2,3-dihydro-3,5-dihydroxy-6-methyl- (14.34%), (4) methyl salicylate (1.14%), (5) 2-furan carbony aldehyde,5-(hydroxymethyl)- (24.45%), (6) dodecanoic acid (1.89%), (7) 1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester (6.06%), (8) n-hexadecanoic acid (15.20%), (9) oleic acid (18.02%) and (10) 1,2-Benzenedicarboxylic acid, disooyctyl ester (12.33%). The properties of the compounds and their bioactivities based on Dr. Duke’s phytochemical and Ethnobotanical databases are listed below.

**Compound 1** was detected as Glycerin and its molecular formula was assigned to be C₃H₈O₃ compound nature was alcohol group, based on the high-resolution GC-MS spectrum. The spectral features and physicochemical properties revealed 1 to be Glycerol. This compound showed RT as 4.07, molecular wt as 92; and peak area as 2-49% (Figure 2.A). It showed the following bioactivities, based on Dr. Duke’s phytochemical and Ethnobotanical databases: Hygroscopic action, anti-inflammatory and antimicrobial properties and also used as softening agent and preservative. It had the following other synonyms: 1. 1,2,3-Propanetriol, 2. Glycerol, 3. Glycerine, 4. Glyceritol, 5. Glycyl alcohol, 6. Glyrol, 7. Glysanin, 8. Osmogly, 9. Propanetriol, 10. Trihydroxy propane, 11. Synthetic glycerin, 12. 90Technical glycerin, 13. Dagrallax and 14. Glycerin anhydrous.

**Compound 2** was detected as Propane, 1,1,3-triethoxy- and its molecular formula was assigned to be C₉H₂₀O₃ compound nature was found to be belong to ether compound, based on the high-resolution GC-MS spectrum. The spectral features and physicochemical properties revealed 2 to be α-Ethoxy propionaldehyde diethyl acetal. This had 5.93 RT, 176 molecular wt. as 4.09 peak area % (Figure2.C). It showed the following bioactivities, based on Dr. Duke’s phytochemical and Ethnobotanical databases: No activity was reported so far. It had the following other synonyms: 1. α-Ethoxy propionaldehyde diethyl acetal; 2. 3-Ethoxypropionaldehyde...
diethyl acetal; 3. Propionaldehyde, 3-ethoxy-, diethyl acetal; 4. 1,1,3-Triethoxypropane; 5. Propylene, 1,3,3-
triethoxy- 6. 1,3,3-Triethoxypropylene.

**Compound 3** was detected as 4H-Pyranyl-4-one, 2, 3-dihydro-5, 5-dihydroxy-6-methyl- and its molecular formula was assigned to be C_{6}H_{6}O_{4} and compound nature was found to be Pyran ring, based on the high-resolution GC-MS spectrum. The spectral features and physicochemical properties revealed 3 to be 4H-Pyranyl-4-one. 2, 3-
dihydro-5, 5-dihydroxy-6-methyl-. This had 7.58RT, 144 molecular wt and 14.34 % peak area (Figure 2.B). It showed the following bioactivities, based on Dr. Duke’s phytochemical and Ethnobotanical databases: No activity was reported. It had the following other synonym: 3.5-Dihydroxy-6-methyl-2,3-dihydro-4H-pyran-4-
one.

**Compound 4** was detected as Methyl Salicylate and its molecular formula was assigned to be C_{8}H_{8}O_{3}, based on the high-resolution GC-MS spectrum. The spectral features and physicochemical properties revealed 4 to be Methyl Salicylate. This compound showed RT as 8.78, molecular wt. as 152; and peak area as 1.14% (Figure 2.D). It showed the following bioactivities, based on Dr. Duke’s phytochemical and Ethnobotanical databases: antipyretic, anti-inflammatory, analgesic, antiseptic, pesticide, insecticide, cancer-preventive carminative and perfumery. It had the following other synonyms: 1. Benzoic acid, 2-hydroxy-methylester; 2.Salicylic acid, methyl ester; 3-o-Hydroxybenzoic acid, methyl ester:4.Analgit; 5.Betula; 6.Betula oil; 7.Betula Lenta; 8.Exagien; 9.Flucarmit;10.Gaultheria oil;11.Gaultheria Oil, artificial; 12.Gaultheria oil; 13.Methyl-
hydroxybenzoate; 14.Methyl2-hydroxy; benzoate;15.Oil of Wintergreen.

**Compound 5** was detected as 2-Furan carboxaldehyde, 5-(hydroxymethyl)-and its molecular formula was assigned to be C_{6}H_{6}O_{3} compound nature was lauric acid, based on the high-resolution GC-MS spectrum. The spectral features and physicochemical properties revealed 5 to be 2-Furancarboxaldehyde, 5-(hydroxymethyl)-. This compound showed RT as 9.03, molecular wt as 126; and peak area as 24.45% (Figure2.E). It showed the following bioactivities, based on Dr. Duke’s phytochemical and Ethnobotanical databases: antimicrobial, preservative. It had the following other synonyms: 1.2-Furaldehyde, 5-(hydroxymethyl)-; 2.5-Hydroxymethylfurural; 3.Hydroxymethylfururalo; 4.HMF;5.5-(Hydroxymethyl) Furfurole;6.5-(Hydroxymethyl)-2-formylfuran; 7.5-(Hydroxymethyl)-2-furaldehyde; 8.5-(Hydroxymethyl)-2-furanarbonal; 9. 5-(Hydroxymethyl)-2-furfural; 10. 5-(Hydroxymethyl)-2-furfuraldehyde; 11. 5-
(Hydroxymethyl)furan-2-aldehyde; 12.5-Hydroxymethyl)furfural; 13.5-Hydroxymethylfuralfurdehyde; 14.5-Oxy methylfurufurole; 15.5-Hydroxymethylfururaldehyde;

**Compound 6** was detected as Dodecanoic acid and its molecular formula was assigned to be C_{12}H_{26}O_{2} compound nature was lauric acid, based on the high-resolution GC-MS spectrum. The spectral features and physicochemical properties revealed 6 to be Dodecanoic acid. This compound showed RT at 17.41, molecular wt as 200; and peak area as 1.89%. It showed the following bioactivities, based on Dr. Duke’s phytochemical and Ethnobotanical databases: antioxidant, antibacterial, COX-1 & COX-2 inhibitor,antiviral hypochloesterolmic, candidicide.

**Compound 7** was detected as 1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester and its molecular formula was assigned to be C_{16}H_{22}O_{4} compound nature was Plasticizer compound, based on the high-resolution GC-MS spectrum. The spectral features and physicochemical properties revealed 7 to be 1,2-Benzenedicarboxylic acid,bis(2-methylpropyl) ester. This compound showed RT as 23.72, molecular wt as 278 and peak area as 6.06% (Figure 2.F). It showed the following bioactivities, based on Dr. Duke’s phytochemical and Ethnobotanical databases: No activity was reported. It had the following other synonyms: 1.Pthalic acid, diisobutyl ester; 2.Diisobutyl phthalate; 3.Hexaplus M/1B; 4.Isobutyl phthalate.

**Compound 8** was detected as n-Hexadecanoic acid and its molecular formula was assigned to be C_{16}H_{32}O_{2} compound nature was Palmitic acid, based on the high-resolution GC-MS spectrum. The spectral features and physicochemical properties revealed 8 to be n-Hexadecanoic acid. This compound showed RT as 25.35, molecular wt as 256; and peak area as 15.20% (Figure2.G). It showed the following bioactivities, based on Dr. Duke’s phytochemical and Ethnobotanical databases: Antioxidant Hypocholesterolemic; Nematicide; Pesticide; Lubricant; Antiandrogenic; Flavor; Hemolytic; 5-Alpha reductase inhibitor. It had the following other synonyms: 1.Hexadecanoic acid;2.n-Hexadecenoic acid;3.Palmitic acid;4.Pentadecanoic acid;5.1-
Compound 9 was detected as Oleic Acid, and its molecular formula was assigned to be \( \text{C}_{18}\text{H}_{34}\text{O}_2 \). Compound nature was Fatty acid, based on the high-resolution GC-MS spectrum. The spectral features and physicochemical properties revealed 9 to be Oleic Acid, ethyl ester. This compound showed RT as 29.14, molecular wt. as 282; and peak area as 18.02% (Table 3, 4 and Figure). It showed the following bioactivities, based on Dr. Duke’s phytochemical and Ethnobotanical databases: Antiinflammatory; Antiandrogenic. It had the following other synonyms: 1.9-Octadecenoic acid (Z)-;2.ë(Sup9)-cis-Oleic acid;3.cis-ë(Sup9)-Octadecenoic acid;4.cis-Oleic Acid;5.cis-9-Octadecenoic Acid;6.Emersol 211;7.Emersol 220 White Oleic Acid;8.Emersol 221 Low Titer White Oleic Acid;9.Oelsauere;10.Oleine 7503;11.Pamolyn 100;12.Red oil.

Compound 10 was detected as 1,2-Benzene dicarboxylic acid, diisooctyl ester and its molecular formula was assigned to be \( \text{C}_{24}\text{H}_{38}\text{O}_4 \). Compound nature was Plasticizer compound, based on the high-resolution GC-MS spectrum. The spectral features and physicochemical properties revealed 1 to be 1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester. This compound showed RT as 35.67, molecular wt as 390 and peak area as 12.33% (Figure 5.H). It showed the following bioactivities, based on Dr. Duke’s phytochemical and Ethnobotanical databases: No activity was reported and so further research has to be carried out with respect to this compound.

Table 3. Isolation and characterization of phytochemical components from alcoholic tuber extract of Antigonum leptopus Hook. & Arn. (GC–MS analysis)

<table>
<thead>
<tr>
<th>No</th>
<th>RT</th>
<th>Name of the compound</th>
<th>Molecular Formula</th>
<th>MW</th>
<th>Peak Area %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.07</td>
<td>Glycerin</td>
<td>( \text{C}_3\text{H}_8\text{O}_3 )</td>
<td>92</td>
<td>2.49</td>
</tr>
<tr>
<td>2</td>
<td>5.93</td>
<td>Propane, 1,1,3-triethoxy-</td>
<td>( \text{C}<em>9\text{H}</em>{20}\text{O}_3 )</td>
<td>176</td>
<td>4.09</td>
</tr>
<tr>
<td>3</td>
<td>7.58</td>
<td>4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-</td>
<td>( \text{C}_6\text{H}_6\text{O}_3 )</td>
<td>144</td>
<td>14.34</td>
</tr>
<tr>
<td>4</td>
<td>8.78</td>
<td>Methyl Salicylate</td>
<td>( \text{C}_8\text{H}_8\text{O}_3 )</td>
<td>152</td>
<td>1.14</td>
</tr>
<tr>
<td>5</td>
<td>9.03</td>
<td>2-Furancarboxaldehyde, 5-(hydroxymethyl)-</td>
<td>( \text{C}_6\text{H}_6\text{O}_3 )</td>
<td>126</td>
<td>24.45</td>
</tr>
<tr>
<td>6</td>
<td>17.41</td>
<td>Dodecanoic acid</td>
<td>( \text{C}<em>2\text{H}</em>{24}\text{O}_2 )</td>
<td>200</td>
<td>1.89</td>
</tr>
<tr>
<td>7</td>
<td>23.72</td>
<td>1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester</td>
<td>( \text{C}<em>{16}\text{H}</em>{24}\text{O}_4 )</td>
<td>278</td>
<td>6.06</td>
</tr>
<tr>
<td>8</td>
<td>25.85</td>
<td>n-Hexadecanoic acid</td>
<td>( \text{C}<em>{16}\text{H}</em>{32}\text{O}_2 )</td>
<td>256</td>
<td>15.20</td>
</tr>
<tr>
<td>9</td>
<td>29.14</td>
<td>Oleic Acid</td>
<td>( \text{C}<em>{18}\text{H}</em>{34}\text{O}_2 )</td>
<td>282</td>
<td>18.02</td>
</tr>
<tr>
<td>10</td>
<td>35.67</td>
<td>1,2-Benzendedicarboxylic acid, diisoctyl ester</td>
<td>( \text{C}<em>{24}\text{H}</em>{38}\text{O}_4 )</td>
<td>390</td>
<td>12.33</td>
</tr>
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</table>

Table 4. Characterization of phytochemical components from alcoholic tuber extract of Antigonum leptopus Hook. & Arn., displaying their bioactivities

<table>
<thead>
<tr>
<th>No</th>
<th>Name of the compound</th>
<th>Compound nature</th>
<th>Activity**</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Glycerin</td>
<td>Alcohol</td>
<td>Antimicrobial, Preservative</td>
</tr>
<tr>
<td>2</td>
<td>Propane, 1,1,3-triethoxy-</td>
<td>Ether compound</td>
<td>No activity reported</td>
</tr>
<tr>
<td>3</td>
<td>4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-</td>
<td>Pyran compound</td>
<td>No activity reported</td>
</tr>
<tr>
<td>4</td>
<td>Methyl Salicylate</td>
<td></td>
<td>Antipyretic, Antiinflammatory, Analgesic, Antiseptic, Pesticide, Insectifuge, Cancer-preventive, Carminative, Perfumery</td>
</tr>
<tr>
<td>5</td>
<td>2-Furancarboxaldehyde, (hydroxymethyl)-</td>
<td>5- Aldehyde</td>
<td>Antimicrobial Preservative</td>
</tr>
<tr>
<td>6</td>
<td>Dodecanoic acid</td>
<td>Lauric acid</td>
<td>Antioxidant, Antibacterial, COX-1 &amp; COX-2 inhibitor, Antiviral, Hypocholesterolemic, Candidicide.</td>
</tr>
<tr>
<td>7</td>
<td>1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester</td>
<td>Plasticizer compound</td>
<td>No activity reported</td>
</tr>
<tr>
<td>8</td>
<td>n-Hexadecanoic acid</td>
<td>Palmitic acid</td>
<td>Antioxidant, Hypocholesterolemic Nematicide, Pesticide, Antiandrogenic, Flavor, Hemolytic 5-Alpha reductase inhibitor</td>
</tr>
<tr>
<td>9</td>
<td>Oleic Acid</td>
<td>Fatty acid</td>
<td>Antinflammatory, Antiandrogenic Cancer preventive,</td>
</tr>
<tr>
<td>S. No</td>
<td>Name of the compound</td>
<td>Plant Name</td>
<td>Plant Part</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>1.</td>
<td>Glycerin</td>
<td><em>Mimosa pudica</em></td>
<td>Leaf</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Promsa serratifolia</em></td>
<td>Leaf</td>
</tr>
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<td></td>
<td></td>
<td><em>Alstonia venerate</em></td>
<td>Leaf</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Morinda citrifolia</em></td>
<td>Leaf</td>
</tr>
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<td></td>
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<td><em>Caesalpinia sappan</em></td>
<td>Aerial part</td>
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<td></td>
<td><em>Vigna mungo</em></td>
<td>Leaf</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Clitoria ternatea</em></td>
<td>Gram</td>
</tr>
<tr>
<td></td>
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<td><em>Cadaba trifoliata</em></td>
<td>Aerial part</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Polygala chinensis</em></td>
<td>Leaf</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Naringi crenulata</em></td>
<td>Root</td>
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<td></td>
<td></td>
<td><em>Euphoria longan</em></td>
<td>Whole plant</td>
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<td></td>
<td>Leaf</td>
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<td>3.</td>
<td>4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl</td>
<td><em>Euphoria longan</em></td>
<td>Leaf</td>
</tr>
<tr>
<td></td>
<td>Methyl Salicylate</td>
<td><em>Syzzygium caryophyllatum</em></td>
<td>Leaf &amp; bud</td>
</tr>
<tr>
<td>5.</td>
<td>2-Furancarboxaldehyde, 5-(hydroxymethyl)</td>
<td><em>Caesalpinia sappan</em></td>
<td>Leaf</td>
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<tr>
<td>6.</td>
<td>Dodecanoic acid</td>
<td><em>Withania somnifera</em></td>
<td>Root</td>
</tr>
</tbody>
</table>
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7. 1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester
   
   Cadaba trifoliata
   Leaf
   
   Euphoria longan
   Leaf
   
   Andrographis paniculata
   Leaf
   
   Purgative
   Amnesia
   Insomnia
   Anemia
   Palpitations
   Neurosis
   Upper respiratory infections
   
   Velmurugan and Kamaraj (2011)
   Devi et al. (2009)
   Kalaivani et al. (2012)

8. n-Hexadecanoic acid
   
   Alstonia venerate
   Leaf
   
   Cadaba trifoliata
   Leaf
   
   Cadaba trifoliata
   Root
   
   Morinda citrifolia
   Lead & fruit
   
   Euphoria longan
   Leaf
   
   Andrographis paniculata
   Leaf
   
   Withania somnifera
   Root
   
   Rheumatic complaints
   Anticancer
   Anti-diabetic
   Anti-inflammatory
   Antibacterial
   Anti-inflammatory
   Analgesic
   Antioxidant
   Antitumor effect
   
   Amnesia
   Insomnia
   Anemia
   Palpitations
   Neurosis
   Upper respiratory infections
   
   Velmurugan and Kamaraj (2011)
   Devi et al. (2009)
   Kalaivani et al. (2012)
   Sutha et al. (2012)
   Velmurugan et al (2010)
   Rivera et al. (2012)

9. Oleic Acid
   
   Cadaba trifoliata
   Root
   
   Polygala chinensis
   Whole plant
   
   Aloe vera
   Plant
   
   Anticancer
   Anti-diabetic
   Anti-inflammatory
   Cough and bronchitis
   
   Velmurugan et al (2010)
   Alagammal et al. (2011)

10. 1,2-Benzenedicarboxylic acid, diisooctyl ester
    
    Polygala chinensis
    Whole plant
    
    Withania somnifera
    Root
    
    Cough and bronchitis
    Anti-inflammatory
    
    Alagammal et al. (2011)
    Kumar et al. (2011)

Figure 1. GC-MS chromatogram of the alcoholic extract of the tuber of Antigonum leptobus
Figure 2. Chemical structure as well as spectrum of a compound viz., A. Glycerin 1, B. 4H-Pyran-4-one, 2, 3-dihydro-3,5-dihydroxy-6-methyl, C. Propane, 1,1, 3-triethoxy, D. Methyl Salicylate, E. 2Furan carboxaldehyde, 5-(hydroxymethyl), F. 1,2-Benzene dicarboxylic acid, bis(2-methylpropyl) ester, G. n-Hexadecanoic acid, H. Oleic Acid
Discussion

Glycerin, Methyl Salicylate, Oleic Acid, Dodecanoic acid, n-Hexadecanoic acid, 2-Furancarboxaldehyde and 5-(hydroxymethyl)- have more bioactivities while Propane, 1,1,3-triethoxy, 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-, 1,2-Benzenedicarboxylic acid, bis (2-methylpropyl) ester, 1,2-Benzenedicarboxylic acid and diisooctyl ester had no activity which was confirmed from Dr. Duke’s phytochemical and Ethnobotanical databases (Table 4).

The present study revealed that the above chemical compounds exhibits high bioactivity. The potential antinoceptive effect by methanolic extract of A. leptopus root could be due to different nociceptive stimuli. Biochemicals and phytochemicals such as saponins, terpenoids, flavonoids, tannins, steroids, and alkaloids have anti-inflammatory effects. Some polycyclic glycosides, flavonoids, tannins, and alkaloids have hypoglycemic. The anti-edematogenic mechanism of action of A. leptopus may also be due to prostaglandin synthesis inhibition as described for the anti-inflammatory mechanism of aspirin-like drugs. Primary metabolites, for example, sugars, proteins, lipids, and starch are of prime importance and essentially required for growth of plants. The studies of primary metabolites have been carried out in some plants in the past such as Balanites aegyptiaca, Cissus quadrangularis, Eclipta alba and Nerium indicum. The identified compounds from A. leptopus were found to have unique bioactivity from earlier reports (Table 5).

The phytochemical screening of A. leptopus showed that the leaves and tuber were rich in alkaloids, saponin, steroid/triterpenoid, phenolic compounds, fatty acid, flavonoids and volatile oils. The present investigation on biochemical compounds of A. leptopus (Glycerin, Methyl Salicylate, Oleic Acid, Dodecanoic acid, n-Hexadecanoic acid, 2-Furancarboxaldehyde and 5-(hydroxymethyl)) show medicinal activity as well as physiological activity. The evaluated A. leptopus being used as traditional medicine must be taken forward to complete phytochemical analysis so as to study in depth the individual potential compounds which will pave way to clinical leads.

Acknowledgements

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References

