The gas chromatography–mass spectrometry study of one ayurvedic pain relieving oil “Mahamasha Thailam”

Hassan Mohammad¹, K. Prabhu¹, Mudiganti Ram Krishna Rao²*, Lakshmi Sundram³, Sruthi Dinakar⁴, M. Sathish Kumar⁵, N. Vijayalakshmi²

ABSTRACT

Objective: The aim of the study is to understand the efficacy of Ayurvedic medicine by subjecting it to gas chromatography–mass spectrometry (GC-MS) analysis. This knowledge could help in finding the molecules that are of medicinal importance.

Materials and Methods: Mahamasha Thailam was bought from a Standard Ayurvedic vendor at Chennai and subjected to GC-MS analysis by standard procedures. Results: The GC-MS results indicated the presence of some important molecules such as n-Hexadecanoic acid, n-Decanoic acid, 2,6-Difluoro-3-methylbenzoic acid, 2,3-dichlorophenyl ester, propane, and 2-methoxy-2-methyl-, which have medicinal roles supporting the pain relieving role of Mahamasha Thailam. Conclusions: GC-MS results indicated that the medicinal roles of some of the important molecules augur well with the activity of Mahamasha thailam. The roles of some other molecules such as 1-Heptanol, 2,4-diethyl-, Cis-3-ethyl-endo-tricyclo[5.2.1.0(2.6)]decane, 3-Octyne, 2,2,7-trimethyl-, 1,3-Benzodioxole, 5,5’-(tetrahydro-1H,3H-furo[3,4-c][1,4- diyl])bis-, [1S-(1.alpha.,3a. alpha.,4.beta.,6a.alpha.)]-, and 1,3-Dioxolane-2-methanol are not reported yet.

KEY WORDS: 2,3-dichlorophenyl ester, 2,6-Difluoro-3-methylbenzoic acid, 2-methoxy-2-methyl-, Ayurvedic, Gas chromatography–mass spectrometry, Mahamasha Thailam, n-Decanoic acid, n-Hexadecanoic acid, Propane

INTRODUCTION

The medicinal efficacy and scientific elucidation of contemporary and alternative medicines can go a long way in elevating the sufferings of human populations around the globe. This has become all the more pertinent in the context of the multiple side effects, high cost, and development of drug-resistant microbes toward modern molecular medicines. The complementary and alternative medicines are prepared by natural products and have fewer side effects and could be used to treat multidrug-resistant microbial diseases also effectively. This is heartening that many reports in this direction are pouring, and much more is to be done. The present work is one such step in this direction.[1-11]

Mahamasha Thailam is an Ayurvedic oil formulation used for massage for diseases such as paralysis, facial palsy, deafness, tinnitus, headache, joint pains associated with lumbar and cervical spondylitis, for Duchenne’s muscular dystrophy, and other neurological conditions. The name Mahamasha indicates the major ingredient, black gram. This thailam is used for the internal application also, for which it is prepared specifically. For internal application, 5–10 drops once or 2 times a day before food with hot water or as directed by Ayurvedic doctor is taken. Asha and Ramachandran, 2017, have reported the positive effects of this thailam on children with cerebral palsy.[12] The positive role of Mahamasha Thailam in combination with other Ayurvedic medicines has shown good results in the treatment of Ardita(Palsy) (Gupta, 2017).[13] Zia-Ul-Haq et al., 2014, have reported the various medicinal role of Vigna mungo.[14] The immune-stimulatory activities of Vigna extracts have been reported by Solanki and Jain, 2010.[15] The anti-osteoarthritic activity of Vigna was reported by Patel et al., 2015.[16]

For the external application of this oil is used for massage, Dhara and Vastiforms of Ayurvedic treatment. The
medicine is prepared according to the standard Ayurvedic treatise, Bhaishajya Ratnavali – Vatavyadhi Prakarana – 26/570-577 and manufactured by AVN Ayurveda Formulations Pvt. Ltd, and Vaidyaratnam Oushadhala, India. Mahamasha Thailam is prepared by an elaborate process which consists of the following steps.

**Step 1**

To the above mixture, 1.44 kg of goat meat is added along with 12.288 l of water and boiled slowly to reduce the volume to 3.072 l which form a kashayam.

**Step 2**

**Step 3**
The paste made in Step 2, the Kashayam made in Step 1, 3.072 l of cow milk and 768 ml of Tilataila (oil of *Sesamum indicum*) are mixed and heated to get the final product, Mahamasha Thailam.

The present study is to understand the presence of biomolecules in Mahamasha Thailam by gas chromatography–mass spectrometry (GC-MS) analysis of this oil. It is of interest to the contributory roles of so many herbs for the preparation of this oil. The medicinal values of all the plants mentioned above are elaborately reported, and it is interesting that so many plants are used for the preparation of this oil.

**MATERIALS AND METHODS**

**Sample Preparation**

Mahamasha Thailam was obtained by the standard Ayurvedic vendor at Chennai, India.

10 ml of sample was dissolved in 1 ml of methanol. The solution was vortexed and filtered through 0.22 µm nylon filter. The clear organic extract was injected to GC-MS for analysis. Mass spectrometer indicated the molecular weights of the compounds and also elucidated their structure. The compounds are identified by GC-MS Library (NIST and WILEY).

**Instrument**

GC (Agilent: GC:(G3440A) 7890A. MS MS: 7000 Triple Quad GCMS,) was equipped with MS detector.

**Figure 1:** Indicate the gas chromatography–mass spectrometry graph of Mahamasha Thailam
Table 1: The retentions values, the type of possible compound, their molecular formulae, molecular mass, peak area, and their medicinal roles of each compound as shown in the gas chromatography–mass spectrometry profile of Karpooradi Thailam

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Retention time</th>
<th>Compound name</th>
<th>Mol. Formula</th>
<th>Mol weight</th>
<th>Peak area</th>
<th>Medicinal role</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7.94</td>
<td>n-Hexadecanoic acid</td>
<td>C16H32O2</td>
<td>256.2</td>
<td>267,375,341</td>
<td>Acidifier, acidulant, arachidonic acid inhibitor, increases aromatic amino acid decarboxylase activity, increases production of uric acid, anaphylactic, antitumor, decrease norepinephrine production, GABAnergic, Increase NK cell activity, myoneural stimulant</td>
</tr>
<tr>
<td>2</td>
<td>9.25</td>
<td>1-Heptanol, 2,4-diethyl-</td>
<td>C11H22O</td>
<td>1,077,895,983</td>
<td>1,077,895,983</td>
<td>Acidifier, acidulant, arachidonic acid inhibitor, increases aromatic amino acid decarboxylase activity, increases the production of uric acid, anaphylactic, antitumor, decrease norepinephrine production, GABAnergic, Increase NK cell activity, myoneural stimulant</td>
</tr>
<tr>
<td>3</td>
<td>9.39</td>
<td>Decanoic Acid</td>
<td>C10H20O2</td>
<td>265.2</td>
<td>185,030,527</td>
<td>Acidifier, acidulant, arachidonic acid inhibitor, increases aromatic amino acid decarboxylase activity, increases the production of uric acid, anaphylactic, antitumor, decrease norepinephrine production, GABAnergic, Increase NK cell activity, myoneural stimulant</td>
</tr>
<tr>
<td>4</td>
<td>12.11</td>
<td>Cis-3-ethyl-endo-tricyclo[5.2.1.0 (2.6)]decane</td>
<td>C13H26</td>
<td>164.2</td>
<td>59,368,752</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>12.15</td>
<td>(2,4,6-Trimethyleclohexyl) methanol</td>
<td>C14H26O</td>
<td>156.2</td>
<td>50,660,871</td>
<td>--</td>
</tr>
<tr>
<td>6</td>
<td>12.45</td>
<td>Furan, 2-methoxy-</td>
<td>C5H10O2</td>
<td>98</td>
<td>56,351,834</td>
<td>--</td>
</tr>
<tr>
<td>7</td>
<td>14.15</td>
<td>Cis-3-Methyl-endo-tricyclo[5.2.1.0 (2.6)]decane</td>
<td>C12H26</td>
<td>152.2</td>
<td>66,562,163</td>
<td>--</td>
</tr>
<tr>
<td>8</td>
<td>14.18</td>
<td>3-Octyne, 2,2,7-trimethyl-</td>
<td>C11H22</td>
<td>98</td>
<td>136,324,112</td>
<td>--</td>
</tr>
<tr>
<td>9</td>
<td>18.36</td>
<td>1,3-Benzodioxole, 5, 5’-(tetrahydro-1H,3H-furo[3,4-c] furan-1,4-diy) bis-, [1S-(1.alpha., 3a. alpha.,4 beta, 6a.alpha)]</td>
<td>C20H18O6</td>
<td>354.1</td>
<td>529,758,435</td>
<td>--</td>
</tr>
<tr>
<td>10</td>
<td>20.11</td>
<td>N-[3,3’-Dimethoxo-4’-(2-piperidin-1-yl-acetylamino)-biphenyl-4-y1]-2-piperidin-1-yl-acetamide</td>
<td>C28H28N4O4</td>
<td>494.3</td>
<td>152,023,092</td>
<td>--</td>
</tr>
<tr>
<td>11</td>
<td>20.14</td>
<td>2,6-Difluoro-3-methylbenzoic acid, 2,3-dichlorophenyl ester</td>
<td>C16H9Cl2F2O2</td>
<td>316</td>
<td>51,616,800</td>
<td>Acidifier, acidulant, arachidonic acid inhibitor, increases aromatic amino acid decarboxylase activity, increases the production of uric acid</td>
</tr>
<tr>
<td>12</td>
<td>22.40</td>
<td>1,3-Dioxolane-2-methanol</td>
<td>C6H10O</td>
<td>104</td>
<td>771,855,853</td>
<td>Catechol-O-methyltransferase inhibitor, methyl-donor, methyl-guanidine inhibitor</td>
</tr>
<tr>
<td>13</td>
<td>23.16</td>
<td>Propane, 2-methoxy-2-methyl-</td>
<td>C5H12O</td>
<td>88.1</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
GC-MS Protocol

Column DB5 MS (30 mm × 0.25 mm ID × 0.25 µm, composed of 5% phenyl, 95% methyl polysiloxane), electron impact mode at 70 eV; helium (99.999%) was used as carrier gas at a constant flow of 1 ml/min injector temperature 280°C; auxiliary temperature 290°C; and ion source temperature 280°C.

The oven temperature was programmed from 50°C (isothermal for 1.0 min), with an increase from 40°C/min to 170°C (isothermal for 4.0 min), then 10°C/min to 310°C (isothermal for 10 min), fragments from 45 to 450 Da. Total GC running time is 32.02 min.

RESULTS AND DISCUSSION

The GC-MS graph is shown in Figure 1, and the list of retention values, molecules present, their possible molecular mass, peak percentage, and possible medicinal role of each is tabulated in Table 1. It was observed that molecules such as n-Hexadecanoic acid, n-Decanoic acid, 2,6-Difluoro-3-methylbenzoic acid, 2,3-dichlorophenyl ester, propane, and 2-methoxy-2-methyl are all fatty acids and fatty acid derivatives. Their medicinal roles are also closely similar, such as they have been reported to have properties such as acidifier, acidulant, arachidonic acid inhibitor, increases aromatic amino acid decarboxylase activity, increases production of uric acid, anaphylactic, antidepressant, decrease norepinephrine production, GABAergic, increase natural killer cell activity, myoneural stimulant, catechol-O-methyl transferase inhibitor, methyl donor, and methylguanidine inhibitor. Basically these properties reflect their antioxidant, nerve stimulant, anti-inflammatory, stimulant, and homeostatic roles which could help in the analgesia and anti-inflammatory effects. The medicinal roles of many of the compounds shown in the GC-MS profile such as 1-Heptanol, 2,4-diethyl-, Cis-3-ethyl-endo-tricyclo[5.2.1.0(2.6)]decane, 3-Octyne, 2,2,7-trimethyl-, 1,3-Benzodioxole, 5,5′-(tetrahydroylo-1H,3H-furo[3,4-c][furanyl-1,4- diyl]bis-, [1S-(1.alpha.,3a.alpha.,4.beta.,6a.alpha.)]-, and 1,3-Dioxolane-2-methanol are not reported yet. The use of so many plants in the preparation of this medicine is still not clear, and more work is warranted to understand the roles of each plant and each molecule shown in the synergistic roles of this medicine.

CONCLUSIONS

From the above results and discussion, it is clear that the molecules present, as shown in GC-MS analysis indicate medicinal values pertaining to Mahamasha Thailam properties for pain alleviation. The use of so many plan materials for the preparation of this medicine is still a challenge, and further work is in progress in this regard.

REFERENCES


Source of support: Nil; Conflict of interest: None Declared