The objectives of this research were to determine the chemical composition of the extract of *Trachyspermum ammi* L. seeds by using gas chromatography-mass spectrometry analysis (GC-MS). The GC-MS is a matchless method for the study and measuring quantity of organic volatile and semi-volatile compounds. Gas chromatography is employed to separates mixtures into individual components employing a temperature-controlled capillary column. Mass spectrometry is utilized to recognize a variety of components from their mass spectra. In the present study, volatile/semi-volatile compounds present in *Ajwain* seed extract were analyzed. *Ajwain* seed extract is extracted by soxhlet extraction method and then analyzed by GC-MS. Total of nine compounds were found and quantified in this study. The major bioactive compounds in *Ajwain* seed extract are 3,5-dimethylanisole (83.19%), 6-octadecenoic acid, methyl ester, (Z)-, 7-octadecenoic acid, methyl ester (7.42%), and 2-cyclohexyl-2,5-cyclohexadiene-1,4-dione, 4-oxime (3.01%).

**Keywords:** Analysis, Extract, Gas chromatography-mass spectrometry (GC-MS), *Trachyspermum ammi*.

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**Conflict of interest:** None

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### INTRODUCTION

*T. ammi* is commonly known as *Ajwain*; it belongs to the family Apiaceae, it is herbaceous plant, the herb is widely grown in dry and semi-dry regions. *Ajwain* is perennial up to 90 cm, the stem is striated, it contains 16 flowers; flowers actinomorphic, white, male, and bisexual; corolla five, petals bilobed; stamens five, alternating with the petals. *Trachyspermumammi* is found all in various regions, such as, Iran, Pakistan, Afghanistan, and India, as well as, europe, while it is indigenous to Egypt. Seeds or fruits of *Ajwain* are used for medical and nutritional purposes. *Ajwain* has an assortment of pharmacological action, and it is utilized as a part of phytomedicine around the globe for treated paralysis, tremor, and palsy as well as other neural disorders in the field of neurology. It also, correct the auditory weakness. *Ajwain* is used in the treatment of cough and gastrointestinal disorders, such as, nausea, reflux, vomiting, abdominal cramps, and loss of appetite.

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After that, the extracts 1 μL of the sample of the solutions was employed in GC-MS for analysis of different compounds.\textsuperscript{9,10}

**GC-MS of T. ammi seeds**

The GC-MS analysis of extract T. ammi seeds was performed using Thermo Scientific triple quadrupole GC-MS (Trace 1300 GC, TSQ 8000 triple quadrupole MS) equipped with TG 5MS (30 × 0.25 mm ID × 0.25 mm df). For GC-MS detection, helium gas was used as a carrier gas at a constant flow rate of 1 mL/min, and an injection volume of 1 μL was employed. The injector temperature was maintained at 250°C, the ion-source temperature was 250°C, and the oven temperature was programmed from 230°C. The oven temperature was maintained at 50°C isothermal at 280°C, mass spectra transfer line temperature.\textsuperscript{11}

**RESULTS AND DISCUSSION**

The GC-MS chromatogram analysis of the extract of T. ammi seeds (Figure 1) showed nine peaks, which indicates the presence of nine phytochemical constituents. The chemical compounds, molecular formula, and molecular weight were as shown in Table 1. The major phytochemical constituents are 3,5-dimethylanisole at RT (7.00), 6-octadecenoic acid, methyl ester, (Z)-, 7-octadecenoic acid, methyl ester at RT (13.67), and 2-cyclohexyl-2,5-cyclohexadiene-1,4-dione,4-oxime at RT (13.92).

From GC-MS analysis, extract of T. ammi seeds contains biological activities compounds such as α-cymene act as antioxidant, anti-inflammatory, antitumor,\textsuperscript{12,13} ψ-terpinene has the antitrypanosomal activity,\textsuperscript{14} n-hexadecanoic acid (palmitic acid) is reported to be an antioxidant, nematicide, and a pesticide,\textsuperscript{15} 3-carene act as general anesthetic,\textsuperscript{16} 3,5-dimethylanisole act as antimicrobial, anti-inflammatory, and antioxidant,\textsuperscript{17} cis-13-octadecenoic acid act as anti-inflammatory, antiandrogenic, anticancer, preservative, and hypocholesterolemic,\textsuperscript{18} trans-13-octadecenoic acid act as an acidifier, arachidonic acid inhibitor, increase aromatic amino acid decarboxylase activity, inhibit the production of uric acid, urine acidifier, anti-inflammatory, antiandrogenic, cancer preventive, dermatitigenic, irritant, anti leukotriene-D4, hypocholesterolemic, 5-alpha reductase inhibitor, anemiagenic, insectifuge, and flavor.\textsuperscript{19}

Thus, GC-MS analysis of Ajwain seed extract is the first step towards understanding the active compounds in this plant.

![Figure 1: GC-MS profile of extract of T. ammi seeds](image)

**Table 1: GC-MS analysis of bioactive components of extract of T. ammi seeds**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>RT</th>
<th>Area %</th>
<th>Compound name</th>
<th>Molecular formula</th>
<th>Molecular weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.04</td>
<td>0.48</td>
<td>o-cymene, 1-methyl1(1-methylethyl)</td>
<td>C\textsubscript{10}H\textsubscript{14}</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>benzene, 1-methyl2,4dimethyl</td>
<td>C\textsubscript{10}H\textsubscript{14}</td>
<td>134</td>
</tr>
<tr>
<td>2</td>
<td>4.45</td>
<td>0.72</td>
<td>ψ-terpinene, cyclohexene, 1-methyl1(1-methylethylidene)</td>
<td>C\textsubscript{10}H\textsubscript{16}</td>
<td>136</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3-carene</td>
<td>C\textsubscript{10}H\textsubscript{16}</td>
<td>136</td>
</tr>
<tr>
<td>3</td>
<td>7.00</td>
<td>83.19</td>
<td>3,5-dimethylanisole</td>
<td>C\textsubscript{9}H\textsubscript{12}O</td>
<td>136</td>
</tr>
<tr>
<td>4</td>
<td>12.25</td>
<td>0.73</td>
<td>n-hexadecanoic acid</td>
<td>C\textsubscript{16}H\textsubscript{32}O</td>
<td>256</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>l(-)-ascorbic acid, 2,6dihexadecanoate</td>
<td>C\textsubscript{38}H\textsubscript{68}O</td>
<td>652</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>estr-1,3,5(10)-tri-en17\textsubscript{a}ol</td>
<td>C\textsubscript{18}H\textsubscript{26}O</td>
<td>256</td>
</tr>
<tr>
<td>5</td>
<td>13.58</td>
<td>1.17</td>
<td>8,11-octadecadienoic acid, methyl ester</td>
<td>C\textsubscript{18}H\textsubscript{34}O</td>
<td>294</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7,10-octadecadienoic acid, methyl ester</td>
<td>C\textsubscript{20}H\textsubscript{34}O</td>
<td>294</td>
</tr>
<tr>
<td>6</td>
<td>13.67</td>
<td>7.42</td>
<td>6-octadecenoic acid, methyl ester</td>
<td>C\textsubscript{18}H\textsubscript{34}O</td>
<td>294</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7-octadecenoic acid, methyl ester</td>
<td>C\textsubscript{20}H\textsubscript{34}O</td>
<td>296</td>
</tr>
<tr>
<td>7</td>
<td>13.92</td>
<td>3.01</td>
<td>2-cyclohexyl-2,5-cyclohexadiene-1,4-dione,4-oxime</td>
<td>C\textsubscript{22}H\textsubscript{35}NO</td>
<td>205</td>
</tr>
<tr>
<td>8</td>
<td>14.23</td>
<td>1.28</td>
<td>Cyclopropaneoctanoic acid, 2-[2-(2-ethylcyclopropyl)methyl]cyclopropyl)methyl,</td>
<td>C\textsubscript{22}H\textsubscript{35}O</td>
<td>334</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>methyl ester</td>
<td>C\textsubscript{18}H\textsubscript{34}O</td>
<td>294</td>
</tr>
<tr>
<td>9</td>
<td>14.34</td>
<td>2.01</td>
<td>trans-13-octadecenoic acid, cis-vaccenic acid</td>
<td>C\textsubscript{18}H\textsubscript{34}O</td>
<td>282</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cis-13-octadecenoic acid</td>
<td>C\textsubscript{18}H\textsubscript{34}O</td>
<td>282</td>
</tr>
</tbody>
</table>
and such a study would be helpful for a more detailed study. Further investigation into the pharmacological importance of *T. ammi* and their diversity and detailed phytochemistry may add new knowledge to the information in the traditional medicinal plants (Table 2).

**CONCLUSION**

In the present study, nine compounds from seeds extract of *T. ammi* (*Ajwain*) were identified by GC-MS analysis. The biological activities of each of the identified phyto components range from antimicrobial, antioxidant, anti-inflammatory, antitumor, antitrypanosomal, and anticancer. The research findings have shown that the seeds of *Ajwain* are extensively rich in secondary metabolites. The plant seeds have a high potential for a vast number of bioactive compounds, which justified its use for various ailments by traditional practitioners. These findings have provided a scientific basis to the ethnomedical usage of the plant. However, isolation of the individual phytochemical constituents, subjecting it to biological activity and toxicity profile, will give fruitful results.

**AUTHORS’ CONTRIBUTIONS**

BA carried out the experiments and analysis, MH participated in interpretation of results, drafted the manuscript, and also helped in the experiments and analysis. AK and JP carried out the characterization of compounds. All authors have read and approved the final manuscript.

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