Chemical Composition of Essential Oil from *Rosmarinus Officinalis* L. Leaves

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**Abstract** – The chemical constituents of the essential oil from leaves of *Rosmarinus officinalis* L. was produced by steam distillation using the Clevenger apparatus. The oil was analyzed by gas chromatography and mass spectrometry (GC-MS). The main constituent of the oil was 1,8-cineole with 81.47% which is important for medicinal and pharmaceutical.

**Keywords** – 1,8-cineole, *Rosmarinus officinalis* L., essential oil.

**1. Introduction**

*Rosmarinus officinalis* L. belonging to Lamiaeceae family, known as Rosemary is grown Mediterranean and distributed throughout the world. It has been utilized for treatment of asthma, eczema and rheumatism as a traditional medicine [1]. Rosemary extracts display many biological activities, including antimicrobial [2], anti-mammary tumorigenesis and anti-mutagenesis [1], antidepressant [3], anti-ulcerogenic [4], anti-inflammatory [5] and antioxidant [6]. The main components of Rosemary are rosmarinic acid which has been reported to have anticarcinogenic, anti-allergic, antimutagenic, antibacterial and antioxidant activities [7, 8].

Essential oils (EOs) are volatile, natural products with terpene skeleton described by an intense scent and are constituted by aromatic plants as secondary metabolites. In nature,
EOs play a significant function in the protection of the plants as antibacterials, antivirals, antifungals, insecticides and also against herbivores by reducing their desire for such plants [9].

Rosemary essential oil is used as brain and nerve tonic, and as a remedy for mental fatigue [10] as well as antiseptic, diuretic, anti depressant and anti spasmodic; it is also used to treat cold, influenza and rheumatic pain [11] and has the ability to enhance the performance of memory [12]. Diversity in the chemical contents of wild rosemary EOs and polyphenolic compounds have been ascribed to many factors, involving the environment [13], abiotic stress [14], genetic heritance [15, 16] and the phenological stages of the plants [17, 18].

Therefore essential oil contents and quantities in Rosemary grown in Denizli exhibit the diversity than the Rosemary grown in other places.

2. Material and Methods

Plant Materials

Rosemary was bought from herbalist in Tokat (collected from Denizli) and identified by Prof.Dr. Isa Telci.

Isolation of essential oil

The Rosemary leaves (30 g) and water (150 mL) were placed in a flask and hydro distillation process was applied using the Clevenger apparatus for 3h. The essential oil sample was separated, dried over sodium sulphate and stored at the fridge until usage.

GC analysis

GC analyses of essential oil were performed on Perkin-Elmer Clarus 500 model Autosystem GC. Acetone was used for dilation of oil (1:10) then injected in the HT-5 column (25 m×0.22 mm×0.1µm film). The column temperature was programmed from 50 to 120 °C at 3 °C/min, 120 to 220 °C 5 °C/min with initial and final temperatures held for 0.64 min (totally 44 min). Helium was used as carrier gas at 5 psi inlet pressure. The temperature was 250 °C for both injector and detector (FID). Diluted samples (1.0 µL) were injected in the split/splitless (50:1 split) mode.

GC–MS analysis

GC/MS analyses were performed on Perkin-Elmer mass spectrometer using BPX5 column (30 m×0.25 mm×0.25µm film). An electron ionization system with ionization energy of 70 eV was used for GC–MS detection. The carrier gas was helium with a flow rate of 1.3 mL/min. Injector and MS transfer line temperatures were set at 230 °C and 250 °C, respectively. The oven temperature was the same as with GC analysis. Diluted samples (1/10 in acetone, v/v) of 1.0µL were injected in the split/splitless (5:1 split) mode.
3. Results and discussion

Rosemary essential oil was generated by hydrodistillation using Clevenger apparatus. Besides the 1,8-cineole (81.47%) which is the main constituent, α-pinene (8.90%), camphor (3.3%), camphene (2.64), cymene (1.95%), α-limonene (1.25%), β-myrecene (0.45%) were determined in Rosemary essential oil (Table 1). 1,8-cineole, a natural compound has a diverse biological effectiveness such as it reduces the activity of NF-κB in vitro [19] and exhibits the antinociceptive and antiinflammatory activities [20]. 1,8-cineole is used to treat the bronchitis and sinusitis, in addition, it exhibits the direct protective effects within the rat and murine system [21, 22]. 1,8-cineole was isolated from Rosemary previously but amount of this molecule was rather low compared with the Rosemary we worked on.

Table 1. Chemical composition of the Rosemary essential oil analyzed by gas chromatography-mass spectrometry and comparison with the literature [23]

<table>
<thead>
<tr>
<th>Compounds</th>
<th>Rt (min)</th>
<th>Oil composition(%)</th>
<th>Oil composition(%)[23]</th>
</tr>
</thead>
<tbody>
<tr>
<td>α-Pinene</td>
<td>4.498</td>
<td>8.90</td>
<td>20.3.12</td>
</tr>
<tr>
<td>Camphene</td>
<td>4.905</td>
<td>2.64</td>
<td>-</td>
</tr>
<tr>
<td>β-Myrecene</td>
<td>5.815</td>
<td>0.45</td>
<td>-</td>
</tr>
<tr>
<td>α-Limonen</td>
<td>7.232</td>
<td>1.25</td>
<td>-</td>
</tr>
<tr>
<td>Cymene</td>
<td>7.322</td>
<td>1.95</td>
<td>1.91</td>
</tr>
<tr>
<td>1.8.Cineole</td>
<td>7.589</td>
<td>81.47</td>
<td>35.22</td>
</tr>
<tr>
<td>Camphor</td>
<td>13.384</td>
<td>3.33</td>
<td>7.65</td>
</tr>
</tbody>
</table>

The content of 1,8-cineole in Rosemary leaves collected from Behira, Egypt was 19.60% [24]. The essential oil generated from Tunisian Rosemary consisted of 35.22% of 1,8-cineole [23]. Another survey carried out in Italy indicated that essential oil of Rosemary leaves included 18.6% of 1.8.cineole [25]. Therefore, the result of this work as 81.47% of 1,8-cineole exhibited the significance of Rosemary grown in Denizli province.

References

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