ESSENTIAL OIL OF *Perovskia angustifolia* FROM KYRGYZSTAN*


The water distilled essential oils from leaves of *Perovskia angustifolia* (Labiatae) collected from three different localities in the Arslonbob mountains of Kyrgyzstan were analyzed by GC/MS. 1,8-Cineole (12.0-27.5%), α-pinene (7.3-14.7%), epi-13-manool (3.8-12.6%), bornyl acetate (1.2-8.7%), camphene (2.5-6.8%), camphor (4.3-6.5%), β-caryophyllene (3.2-6.5%), caryophyllene oxide (1.7-5.9%), α-humulene (2.1-5.2%), humulene epoxide II (1.9-4.8%), caryophylladienol (1.4-4.3%), and borneol (3.0-3.2%) were found as major constituents.

*Perovskia angustifolia* (Labiatae) is a semi-shrub with a height 50-100 cm. The plant flowers in June-July. Fruits ripen in July-August. It grows on the outskirts of the mountains in Tashkent, Fergana, Samarkand, Surhandarya regions of Uzbekistan. It is endemic in Central Asia.

*Perovskia angustifolia* Kudr. and *Perovskia kudrjaschevii* Piat. are synonymous. *Perovskia botschantzevii* is the synonym or a variety of *Perovskia angustifolia*.

The following biological activities have been reported for *P. angustifolia*. Leaf extract has antihelmintic activity. Plant extract is used for skin diseases, stomach disorder, and as diuretic. An ointment prepared from the extract exhibited antibacterial activity. Flowers yield 260 kg/h nectar for honeybees. The white-flowering form of this species is esteemed for its ornamental value [1, 2].

Very few reports exist in the literature on the essential oils of *Perovskia* species. *Perovskia abrotanoides* Karel. collected from four different localities in mountains of Kyrgyzstan was reported to contain oil with 1,8-cineole (6.5-11.0%), α-pinene (5.0-6.2%), camphene (4.8-7.5%), δ-3-carene (8.5-14.5%), camphor (27.0-36.0%), β-caryophyllene (2.7-4.1%), β-selinene (2.3-3.1%), humulene (2.4-3.3%), polystyrol (3.5-6.5%), terpinen-4-ol (1.5-3.1%), and limonene (0.9-2.3%) as major components [2]. The author of this report studied *Perovskia angustifolia* Kudr. collected from two different localities in the Chimgan mountains of Uzbekistan and from one locality along the river Aflotun in Kyrgyzstan. Major constituents found in the oils were as follows: α-pinene (13.2-15.5%), camphene (2.8-4.5%), β-pinene (5.0-6.0%), δ-3-carene (1.8-4.5%), β-myrcene (3.5-5.8%), limonene (1.7-3.1%), 1,8-cineole (21.0-23.5%), p-cymene (2.7-4.1%), linalool (4.2-10.1%), β-caryophyllene (6.0-6.5%), humulene (3.2-4.7%), and ledol (0.9-20.0%) [2]. In a separate study, 2.2% essential oil was obtained from *Perovskia abrotanoides* Karel. with 1,8-cineole (31.5%), α-pinene (13.7%), myrcene (9.5%), germacrene D (8%), and limonene (7.4%) as major constituents [3].

In this study, we have analyzed the essential oils of *Perovskia angustifolia* Kudr. from three different localities in the Arslonbob mountains of Kyrgyzstan. The essential oils were analyzed by GC/MS. Results are given in Table 1. 1,8-Cineole, α-pinene, epi-13-manool, bornyl acetate, camphene, camphor, caryophyllene oxide, α-humulene, humulene epoxide II, caryophylladienol, and borneol were found as major constituents.

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*Materials presented at the 2nd International Conference of Natural Compounds.*

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**TABLE 1. Composition of the Essential Oils of *Perovskia angustifolia***

<table>
<thead>
<tr>
<th>Compounds</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Compounds</th>
<th>A</th>
<th>B</th>
<th>C</th>
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<tbody>
<tr>
<td>Amounts, %</td>
<td></td>
<td></td>
<td></td>
<td>Amounts, %</td>
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<td>7.25</td>
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<td>-</td>
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<td>-</td>
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<td>arnemulandrene</td>
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<td>1.77</td>
<td>2.85</td>
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<td>camphene</td>
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<td>trans-pinocarveol</td>
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<td>2.54</td>
<td>γ-muurolene</td>
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<td>-</td>
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<td>-</td>
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<tr>
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<td>12.0</td>
<td>27.5</td>
<td>carvone</td>
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<td>0.12</td>
<td>-</td>
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<td>0.20</td>
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<td>-</td>
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<td>2.86</td>
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<tr>
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<td>-</td>
<td>0.10</td>
<td>cis-jasmone</td>
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<td>-</td>
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<tr>
<td>α-thujone</td>
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<td>-</td>
<td>-</td>
<td>caryophyllene oxide</td>
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<td>3.92</td>
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<td>0.18</td>
<td>methyl eugenol</td>
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<tr>
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<td>-</td>
<td>0.08</td>
<td>humulene epoxide I</td>
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<td>0.75</td>
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<td>ledol</td>
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<tr>
<td>camphor</td>
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<td>6.47</td>
<td>4.31</td>
<td>humulene epoxide II</td>
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<td>4.76</td>
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<td>-</td>
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<tr>
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<td>spathulenol</td>
<td>0.08</td>
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<tr>
<td>trans-p-menth-2-en-1-ol</td>
<td>-</td>
<td>-</td>
<td>0.06</td>
<td>eugenol</td>
<td>0.17</td>
<td>0.88</td>
<td>0.11</td>
</tr>
<tr>
<td>pinocarveol</td>
<td>0.12</td>
<td>0.27</td>
<td>-</td>
<td>carvacrol</td>
<td>0.06</td>
<td>-</td>
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<td>bornyl acetate</td>
<td>8.72</td>
<td>1.22</td>
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<td>caryophyllalcohol*</td>
<td>0.14</td>
<td>0.50</td>
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<tr>
<td>β-caryophyllene</td>
<td>3.17</td>
<td>6.50</td>
<td>3.17</td>
<td>caryophyllenol*</td>
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<tr>
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<td>-</td>
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<td>4-epi-15-manool</td>
<td>3.81</td>
<td>12.6</td>
<td>4.01</td>
</tr>
</tbody>
</table>

*Tentative identification by GC/MS data alone.

**EXPERIMENTAL**

The water distilled essential oils from leaves of *Perovskia angustifolia* collected from three different localities (A, B, and C) in the Arslonbob mountains of Kyrgyzstan in October, 1994 were analyzed by GC/MS. The leaves were subjected to hydrodistillation for 3 h using a Clevenger-type apparatus to produce essential oils in 1.1%, 0.82%, and 0.75% yields, respectively. The percentage yields of the oils were based on a moisture free basis.

The essential oils were analyzed by GC/MS using a Hewlett-Packard GCD system. An Innowax FSC column (60 m × 0.25 mm OD) was used with helium as carrier gas. GC oven temperature was kept at 60°C for 10 min and programmed to 220°C at a rate of 4°C/min and then kept constant at 220°C for 10 min. Split ratio was adjusted at 50:1. The injector temperature was 250°C. MS were taken at 70 eV. Mass range was from m/z 10 to 425. A library search was carried out using the Wiley GC/MS Library and the TBAM Library of Essential Oil Constituents [4-9]. Relative percentage amounts of the separated compounds were calculated from total ion chromatograms by the computerized integrator.

**REFERENCES**