VOLATILE CONSTITUENTS OF THE FLOWER OF
SALVIA HYDRANGEA DC. EX BENTH

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ABSTRACT

The essential oil obtained by steam distillation of the flowers of Salvia hydrangea DC. ex BENTH grewed in Isfahan Province was investigated by TLC, GC and GC/MS. Twelve components were characterized representing 93.91% of the total components detected. Caryophyllene oxide (75.02%) and patchouli alcohol (9.59%) were the major constituents of the oil obtained in 0.25% yield.

Key Words: Salvia hydrangea, Lamiaceae, essential oil composition, caryophyllene oxide, patchouli alcohol

INTRODUCTION

The genus Salvia, which belongs to the Lamiaceae family, consists of about 800 to 900 species widespread throughout the world (1-3). In Iran, about 50 to 70 species are present, of which some are endemic (1,4). Many reports on the oil analysis of the Salvia species are in the literature (3,5-10). Salvia hydrangea is one of the Salvia species in Iran that grows in several areas (1,4,12) and have been widely used in Iranian folk medicine as carminative, spasmyloytic, anodyne and anti-inflammatory remedy (13,14). The inflow-rescence of S. hydrangea is used also for making a herbal tea (13). There is a report on the composition of the volatile oil of the whole plant of S. hydrangea and spathulanol, 1,8- cineole, α-pinene and β-caryophyllene were found to be the main constituents of the oil (15). In this work, a sample of the flower oil of S. hydrangea was studied by combined chromatographic (TLC and GC) and GC/MS techniques.

EXPERIMENTAL

Plant Material: The S. hydrangea flowers were collected from plants growing in the near of Dehaghan (Isfahan Province) at an altitude of 2090 m on June 1,1994 and identified by Dr. V. Melzheimer (Botanical Garden, Philipps-Universitat, Marburg, Germany) and Mrs M. Khatamsaz (Herbarium Department, Research Institute of Forests and Rangelands, Tehran, Iran). A voucher specimen of this plant material was deposited in the Herbarium of Faculty of Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Sciences, Isfahan, Iran.

Isolation of Volatile Oil: The air-dried flowers were powdered and the volatile fraction was isolated by hydrodistillation for 3 hours according to the method recommended in the European Pharmacopoeia (16). The oil was dried over anhydrous sodium sulfate and stored at 4°C in the dark.

Thin Layer Chromatography: The oil was tentatively identified on silica gel GF-254 precoated plates (Merck) using some pure authentic samples for comparison. These samples were; borneol, linalool, caryophyllene oxide and β-caryophyllene. The mobile phase was benzen-ethyl acetate (98 : 2 by volume), and UV detection was at 254 nm. Further characterizations were achieved by anisaldehyde reagent and Rf values (11,17).

Gas Chromatography: GC analysis was carried out on a Hewlett Packard 5890 gas chromatograph fitted with a flame ionization detector and a megabore crosslinked methyl silicone fused-silica column (OV-1, J. & W.

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Scientific: 30 m x 0.31 mm i.d., film thickness 3 μm.). The carrier gas was nitrogen with a flow rate of 2.5 ml/min. The oven temperature was programmed from 100 °C to 280 °C at 8°C/min. Injector and detector temperatures were 270 °C.

GC/MS: A Kratos Concept 25 spectrometer was used, equipped with a Sun Mash 3 computer data output. The same OV-1 column was used and the GC operating conditions were as above but using helium as the carrier gas. Mass spectrometer conditions were as follows: ionization potential, 70 ev; ion source temperature, 150°C; resolution, 1000; scan time 1 Sec; ionization current, 1 A. The identification of the constituents was based on the computer matching against the library spectra built up using pure substances and components of the known essential oils, and MS literature data (18-21) and were confirmed by their GC retention times, as well as, whenever possible, chromatography on silica gel plates with some pure authentic samples. The percentage composition of the essential oil was computed in each case from GC peak areas without using correction factors and in comparison with n-decane as standard.

RESULTS AND DISCUSSION

The flower oil yield of S. hydrangea was 0.25% based on dried weight of sample and the oil was pale yellowish in color. On the basis of TLC experiments, the Rf of borneol, linalool, caryophyllene oxide and β-caryophyllene of the oil was respectively 0.38, 0.45, 0.55 and 0.93. These results were nearly similar to the Rf of pure authentic samples (11,17). After analyses, twelve compounds representing 93.91% of the flower oil were identified as listed in table 1, according to their elution times on OV-1 column. Caryophyllene oxide and patchouli alcohol were the most prominent compounds in the flower oil of S. hydrangea from Deaghan, Isfahan Province, Iran, accounting for 75.02% and 9.59% respectively. Other major components were β-caryophyllene (1.87%), borneol (1.38%), linalool (1.28%) and endo-fenchyl acetate (1.21%). The sample oil consists mainly sesquiterpenoids (87.03%) of which 75.02% is caryophyllene oxide. Low percentages of the monoterpenoid components (6.88%) were detected in the flower oil. Many of the identified compounds in the flower oil of S. hydrangea were common in essential oils of other Salvia species, but in contrast to the literature, no α-pinene, β-pinene and thujone were detected in the oil and only traces of 1,8-cineole, camphor and borneol were found in the oil. These components are very common in the essential oils of Salvia species (3,5,10,15). Results of the present investigation also indicate differences to the composition of the oil of whole plant of S. hydrangea reported earlier (15). Thus, it appears from these results that the flower oil of S. hydrangea from Deaghan gives a yield of essential oil with a high content of caryophyllene oxide and therefore the oil is a valuable source of caryophyllene oxide.

Table 1. Chemical composition of the flower oil of Salvia hydrangea

<table>
<thead>
<tr>
<th>Compound</th>
<th>Retention Indices</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ρ-cymene</td>
<td>1026</td>
<td>0.16</td>
</tr>
<tr>
<td>1,8-cineole</td>
<td>1031</td>
<td>0.98</td>
</tr>
<tr>
<td>Linalool</td>
<td>1099</td>
<td>1.28</td>
</tr>
<tr>
<td>Camphor</td>
<td>1140</td>
<td>0.66</td>
</tr>
<tr>
<td>Borneol</td>
<td>1162</td>
<td>1.38</td>
</tr>
<tr>
<td>4-terpineol</td>
<td>1179</td>
<td>0.39</td>
</tr>
<tr>
<td>α-terpineol</td>
<td>1190</td>
<td>0.82</td>
</tr>
<tr>
<td>Endo-fenchyl acetate</td>
<td>1222</td>
<td>1.21</td>
</tr>
<tr>
<td>β-caryophyllene</td>
<td>1425</td>
<td>1.87</td>
</tr>
<tr>
<td>Spathulonol</td>
<td>1572</td>
<td>0.55</td>
</tr>
<tr>
<td>Caryophyllene oxide</td>
<td>1581</td>
<td>75.02</td>
</tr>
<tr>
<td>Patchouli alcohol</td>
<td>1661</td>
<td>9.59</td>
</tr>
<tr>
<td>Identified compounds</td>
<td></td>
<td>93.91</td>
</tr>
<tr>
<td>Unidentified compounds</td>
<td></td>
<td>6.09</td>
</tr>
</tbody>
</table>

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REFERENCES