Quali-quantitative analysis of eight Rosmarinus officinalis essential oils of different origin. First report.

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Aim. It is well known that the pharmacological activity of essential oils depends on their major components, which may vary enormously. The aim of the present study was to determine the chemical composition of samples of essential oil of rosemary of different origins, in order to identify the main therapeutic constituents, according to European Pharmacopoeian (EP).

Material and Methods. Analytical GC/MS was carried out on a total of eight samples of essential oil of rosemary: seven samples were commercial products from producers located in different geographical areas; the last sample was prepared in our laboratory from fresh flowering terminal sprigs of rosemary collected in Siena's Province.

Results. The most representative constituents of the essential oils tested were 1,8-cineole and camphor. Other components also occurred in significant quantities in some samples, for example and α- and β-pinene, limonene and caryophyllene, indicating clear phytochemical differences among samples.

Discussion. The high quantity of eucalyptol and camphor detected in the samples made them particularly suited for treating minor respiratory disorders. Eucalyptol is expectorant and liquefies bronchial secretions; camphor increases the interval between inspiration and expiration and increases the activity of the parasympathetic nervous system, facilitating respiration. On the other hand, the essential oils analyzed by us were not suitable for perfume production, because they contained little or no positive aromatic components.

Key words. Rosmarinus officinalis, essential oil, 1,8-cineole, camphor.

Introduction

Rosmarinus officinalis L. is a xeromorphic species that grows spontaneously on sand, cliffs and stony places near the sea in Europe, Africa and Asia (1). In Italy it is spontaneous along all coasts except the northern Adriatic (1). Italian production of essential oil of rosemary is supplemented with imports from Spain, Morocco, ex-Yugoslavia region and Tunisia (2).

The plant is of economic importance because of essential oils extracted by steam distillation from fresh leaves. The European Pharmacopoeia (3) lists the following constituents of “Rosemary Oil”: α- and β-pinene, camphor, 1,8-cineole, camphene, limonene and borneol.

Distillation of essential oil is mainly carried out in Spain, France, Tunisia, Morocco, ex-Yugoslavia, Dalmatia, Sardinia and Sicily. Spain produces the largest quantity of this essence, the quality of which may vary considerably (4).

Conventional medicine recognizes various therapeutic properties of rosemary oil, principally those of antispasmodic (5), antiseptic and antimicrobial (5, 6, 7), especially in respiratory diseases (8) and also those of stomachic, stimulant, revulsive and hyperemizing agent (4, 9).

It is well known that the pharmacological activity of essential oils depends on their major components, which may vary enormously. The aim of the present study was to determine the chemical composition of eight samples of essential oil of rosemary of different origins, in order to identify the main therapeutic constituents, according to European Pharmacopoeian (EP).

Materials and methods

Essential oils

A total of eight samples of essential oil of rosemary were analysed: seven samples were commercial products from producers located in different geographical areas. The oils were labelled as being steam distilled from fresh flowering sprigs of R. officinalis as described in EP. The other sample was prepared in the same way by us from fresh flowering terminal sprigs of rosemary collected in the municipality of S. Quirico d’Orcia (Siena, Italy).

Gas chromatography-mass spectrometry

Analytical GC/MS was carried out on a Varian 3800 (Varian, Walnut Creek, CA) gas chromatograph interfaced with a Varian Saturn 2000 mass spectrometer. A Rtx-5MS (Restek Bellefonte, PA, USA) column (30 m x 0.25 mm, 0.25 μm film thickness) was employed, with helium as carrier gas (flow rate 1.0 mL/min). Samples were injected using the split sampling technique, ratio 1:10; 1.0 μl of sample (diluted 1:10 in chloroform) was injected. Oven temperature was held at 60°C for 8 min, then programmed at 3°C/min to 180°C, held there for 5 min. The MS operating parameters were: electron ionization 70 eV; scan m/z range 40-650. Identification of the constituents was carried out by comparing the retention times with those of reference compounds or by peak-matching library search using the NBS/NIST library and comparison of the MS data with those published in references works (10, 11).
RESULTS
The volatile compounds identified in the eight rosemary samples are shown in Table 1, together with their respective percentages, in order of elution from the column.

<table>
<thead>
<tr>
<th>Compound</th>
<th>percentage concentration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample no.</td>
<td>1</td>
</tr>
<tr>
<td>camphene</td>
<td>3.71</td>
</tr>
<tr>
<td>β-pinene</td>
<td>9.05</td>
</tr>
<tr>
<td>myrcene</td>
<td>1.78</td>
</tr>
<tr>
<td>limonene</td>
<td>3.55</td>
</tr>
<tr>
<td>1,8-cineole</td>
<td>48.25</td>
</tr>
<tr>
<td>linalool</td>
<td>0.27</td>
</tr>
<tr>
<td>camphor</td>
<td>6.89</td>
</tr>
<tr>
<td>borneol</td>
<td>tr</td>
</tr>
<tr>
<td>bornyl acetate</td>
<td>1.96</td>
</tr>
<tr>
<td>caryophyllene</td>
<td>5.11</td>
</tr>
</tbody>
</table>

DISCUSSION
Under “Rosmarini aetheroleum”, the EP (3) lists eleven principal components characteristic of rosemary-type essence obtained from plants grown in Morocco, Tunisia and Spain. To characterize the samples of the present study, we therefore indicate the components listed in the EP as well as a further component, identified as caryophyllene, which we found in all samples in quantities sufficient to be considered representative. The EP specifies that essence from Spain is low in 1,8-cineole (1-2.2%), but high in α-pinene (18-26%) and camphor (13-21%), whereas essence from north Africa are much richer in 1,8-cineole (38-55%), with quantities of borneol, camphor and α-pinene around 10%. This is the most widely available essential oil.

In the analyzed samples, the most representative components were 1,8-cineole and camphor. According to Lugli and co-workers (5), a good essential oil of rosemary should contain 20-50% eucalyptol. Our samples of the eight rosemary samples are shown in Table 1, together with their respective percentages, in order of elution from the column.

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REFERENCES