ORIGINAL ARTICLES

Antimicrobial Effect of Essential Oils From the Algerian Medicinal Plant Mentha Rotundifolia L.

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ABSTRACT

The antimicrobial activities of the Algerian Mentha Rotundifolia L. were tested in vitro by a bioassay on four bacterial strains: Enterobacter, Escherichia coli, Pseudomonas aeruginosa and Proteus mirabilis and were evaluated using agar disc diffusion testing according to NCCLS criteria. Essential oil showed a relative high activity against Escherichia coli and Proteus mirabilis, with an inhibition zone of 24 and 22 mm respectively.

Key words: Essential oils, Mentha Rotundifolia, antimicrobial activity.

Introduction

Plant extracts have long been used to treat many diseases, and plant sourced materials play a major role in primary health care in many countries. Moreover, the screening of such plant extracts for antimicrobial activity has always been of a great interest to scientists looking for new sources for drugs to treat various diseases. Mints (Lamiaceae) are long-lived herbaceous plants, very odorous and widespread in wet places. The genus Mentha L. includes 18 species and 11 hybrids, among which several species are cultivated for essential oil production. Indeed, mint oils are among the most important essential oils produced in the world. In Algeria the genus is represented by six species namely: M. rotundifolia, M. longifolia, M. spicata, M. aquatica, M. pulegium and M. piperita; (Quezel and Santa, 1963). Mentha rotundifolia L. is a long-lived plant, with a strong apple odour, drawn up stems, small or average (80 cm maximum), always covered with a thick sleeping bag with a ramified rhizome (Beauquesne et al., 1980). It is a hybrid of Mentha longifolia and Mentha suaveolens (Lorenzo et al., 2002) whereas for other authors Mentha rotundifolia et Mentha suaveolens correspond to the same species (Hendriks et al., 1976). It is commonly known as ‘pineapple mint’, grows in wet places in Western Europe to eastern Europe and in northern Africa (Lawrence et al., 2007) as well as in the temperate countries of the Southern hemisphere (Lorenzo et al., 2002). It is always used as condiment and it has been applied in the traditional medicine for a wide range of actions: tonic, stimulative, stomachic, carminative, analgesic, holeritic, antispasmodic, anti-inflammatory, sedative, hypotensive and insecticidal. (Moreno et al., 2002; Idrissi et al., 1989). For instance, high values of AChE (acetylcholine esterase) inhibitory activity were found using decoctions of M. rotundifolia (Ferreira et al., 2006).

The essential oils are generally aromatic oils obtained by the steam or hydrodistillation of plants. Essential oils are the odorous principles found in the various parts of plant, and when exposed to the air at ordinary temperatures they substantially evaporate, which also explains the use of terms like volatile oils or ethereal oils. Essential was chosen to describe these oils because they represent the "essence" or characteristic odour of a plant (Tanker, 1990). Essential oils have many biological activities. They have been known to exhibit biological activities, especially antimicrobial (Marzouk et al., 2008), antifungal (Bouchra et al., 2003) insecticidal (Pavela, 2005), antiparasitic, spasmyloytic and antioxidant activities (Larousse, 2001). In phytotherapy, they are used for their disinfectant properties against infectious diseases of bacterial origin. Mint oils present remarkable antibacterial activities against Gram+ and Gram- bacteria. Their antimicrobial activity is related mainly to their chemical composition, and in particular to the nature of their major volatile compounds (Hudaib et al., 2002). The chemical composition of essential oils of Mentha rotundifolia growing in various regions of Algeria was reported to contain mainly Piperitenone, Menthol, Piperitone, Menthyacetate, and pulegone (Moussa et al., 2007).

In continuation of our phytochemical and antibacterial studies of the Algerian Sahara medicinal plants (Kalla et al., 2009; Gherraf et al., 2010; Kalla et al., 2010; Labed et al. 2010; Kendour et al., 2010.), we report here the findings of our studies on the antimicrobial activity of the south-Algerian Mentha rotundifolia essential oils. The species was collected during May (2010) in southeastern Algeria (El-Hdjira) near Ouargla and

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identified by Dr. Abdelmadjid Chahma, Biology department, Ouargla university, Algeria. A voucher specimen was deposited at the herbarium under the code SL 33.

**Materiel and Methodes**

The air parts (200g) of *Mentha rotundifolia* were shade dried at room temperature and hydrodistilled for 3 h using a cleveger-type apparatus. The oil was extracted from the distillate with diethyl ether and then dried over anhydrous calcium sulphate. After filtration, the solvent was removed under reduced pressure and the pure oil was kept at 4°C in the dark prior to analysis. The yield of the essential oil produced during the hydrodistillation was 0.8 % (v/w).

**Antibacterial Activity:**

**Microorganism Strains:**

The clinical bacteria strains *Pseudommonas aeroginosa*, *Enterobacter*, *Escherichia coli* and *Proteus mirabilis* were obtained from the Bacteriology Laboratory, Med Boudiaf hospital, Ouargla.

**Antibacterial Essay:**

The Anti-microbial assay was carried out on essential oil using agar diffusion method (NCCLS), against four human pathogenic bacteria: *Pseudommonas aeroginosa*, *Enterobacter*, *Escherichia coli* et *Proteus mirabilis*.

The antimicrobial activity was carried out according to the disc diffusion assay. The strains were maintained in agar at room temperature. 2,5 mL of every bacteria inoculum were incubated in Mueller-Hinton agar at 37 °C for 18 hours. The bacterial inoculum was adjusted to the Mac Farland N°: 0,5 turbidness patron (10^{6-8} uf/mL). Every inoculum was spread over plates containing Mueller-Hinton agar and a paper filter disc (6 mm) saturated with 10 μL of essential oil. The plates were left for 30 min at room temperature and then incubated at 37°C for 24 h. The antibacterial activity was assessed by measuring the zone of growth inhibition surrounding the discs. Each experiment was carried out in triplicate.

**Results and Discussion**

The data reported in Table 1 presents the antimicrobial activity of the essential oil of *Mentha rotundifolia*. The results indicate that the EO from this medicinal plant showed inhibition of growth of the tested microorganisms with various degrees.

The EO were found to be most effective as antimicrobial agent against *Escherichia coli* and *Proteus mirabilis* with inhibition zones of 24 mm and 22 mm respectively. Noneless, they exhibited a fair antibacterial activity against *Enterobacter* and *Pseudomonnas aeroginosa*. Obviously, the investigated EO of *M. rotundifolia* from Algeria exhibits some similarities with the EO of *M. rotundifolia* from Ajaccio (Corsica) and that from morocco (Sylvain et al., 2008; Derwich et al., 2010) in spite of some differences which may be due to its chemical composition.

<table>
<thead>
<tr>
<th>Bacterial strains</th>
<th>Inhibition Zone (mm)</th>
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<tbody>
<tr>
<td>Enterobacter</td>
<td>10</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>24</td>
</tr>
<tr>
<td>Pseudomonnas aeroginosa</td>
<td>11</td>
</tr>
<tr>
<td>Proteus mirabilis</td>
<td>22</td>
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</tbody>
</table>

**Conclusion:**

The present study has dealt with the determination of the antibacterial activity of essential oils extracted from *Mentha rotundifolia*, collected in the sahara region near ouargla (southeast of Algeria). The essential oil yield of the study was 0.8 %. The oil was found to have significant antibacterial activity and therefore can be used as a natural antimicrobial agent for the treatment of several infectious diseases caused by these germs, which have developed resistance to antibiotics.
References


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