CHEMISTRY & BIODIVERSITY

Chemical Composition, Antibacterial, Antibiofilm and Synergistic Properties of Essential Oils from *Eucalyptus globulus* Labill. and Seven Mediterranean Aromatic Plants

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Essential oils (EOs) from *Eucalyptus globulus* Labill. ssp. *globulus* and from Mediterranean autochthonous aromatic plants – *Thymus mastichina* L., *Mentha pulegium* L., *Rosmarinus officinalis* L., *Calamintha nepeta* (L.) Savi ssp. *nepeta*, *Cistus ladanifer* L., *Foeniculum vulgare* L., *Dittrichia viscosa* (L.) Greuter ssp. *viscosa* – were extracted by hydrodistillation and characterized by GC-FID and NMR spectroscopy. EOs were evaluated for antimicrobial properties against several bacterial strains, using diverse methods, namely, the agar disc-diffusion method, the microdilution method, the crystal violet assay and the Live/Dead staining for assessment of biofilm formation. Potential synergy was assessed by a checkerboard method. EOs of *R. officinalis* and *C. ladanifer* showed a predominance in monoterpene hydrocarbons (> 60%); EOs of *C. nepeta*, *M. pulegium*, *T. mastichina*, *E. globulus* and *F. vulgare* were rich in oxygenated monoterpenes (62 – 96%) whereas EO of *D. viscosa* was mainly composed of oxygenated sesquiterpenes (54%). All EOs showed antimicrobial activity; *M. pulegium* and *E. globulus* generally had the strongest antimicrobial activity. EO of *C. nepeta* was the most promising in hampering the biofilm formation. The combinations *D. viscosa*/*C. nepeta* and *E. globulus*/*T. mastichina* were synergistic against *Staphylococcus aureus*. These results support the notion that EOs from the aromatic plants herein reported should be further explored as potential pharmaceuticals and/or food preservatives.

Keywords: Wild-grown aromatic plants, Essential oils, Antibacterial activity, Antibiofilm, Synergistic effects.

Introduction

Recent years have seen an increased interest in the bioactive compounds produced by organisms such as plants, fungi and bacteria, since they are very likely to possess pharmacological and biotechnological potential. Bacteria resistant to common antibiotics have reached alarming levels in many parts of the world indicating that many of the available treatment options for ordinary infections are becoming ineffective, which is causing prolonged illness, longer stays in hospitals and increased mortality.[1] It is of consensus that the development of new antimicrobial drugs and alternative therapies is crucial and urgent.

Medicinal plants are an important source of research for the pharmaceutical and food industries.[2] Particularly, in the past few decades, medicinal and

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