

The composition and antibacterial activity of essential oils in three *Ocimum* species growing in Romania

Research Article

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Abstract: In this study the glandular hair morphology, chemical composition and antimicrobial activity of the essential oils from three *Ocimum* species have been investigated (*Ocimum basilicum* L. var. *Genovese*, *O. gratissimum* and *O. tenuiflorum*). The indumentum shows little variation among the investigated species with both glandular and non-glandular hairs presents. Glandular hairs on the three species are peltate and capitate (with various cell numbers in the stalk and gland). The samples of essential oils obtained from the plant aerial organs by hydrodistillation have been analyzed by GC–MS. Linalool (65.38%, 74.22%, 38.60%), eugenol (5.26%, 3.47%, 10.20%) and tau-cadinol (8.18%, 3.47%, 10.20%) appear as the main components in *Ocimum basilicum* L. var. *Genovese*, *O. gratissimum* and *O. tenuiflorum*. The oils also contain lower levels of α -bergamotene, 1,8-cineole, germacrene D, β -ocimene, α -caryophyllene, camphor, and α -guaiene. All essential oils showed antibacterial activity against *Staphylococcus aureus* and *Escherichia coli* depending on their concentration. *Ocimum basilicum* L. var. *Genovese* oil produced the strongest antibacterial effect on *S. aureus* and *E. coli*.

Keywords: *Ocimum* species • Essential oils • Glandular hairs • Antimicrobial activity

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1. Introduction

Ocimum species are annual and perennial herbs and scrubs, mostly native to the tropical and warm temperate regions (India, Africa and Southern Asia). They are members of the Lamiaceae family, and are cultivated worldwide under a variety of ecological conditions. The genus *Ocimum* (Lamiaceae) consists of about 50–150 species [1] with a large number of varieties.

Basil has been used as a medicinal and aromatic plant for centuries. Due to their pharmaceutical and medical properties, basil species are used in the treatment of headaches, cough, diarrhoea, antihelminthic treatments, and in kidney dysfunctions [2,3]. The leaves can be used in fresh and dried state, as edibles or spices [3]. Essential oils extracted from both fresh and dried material are frequently used as flavour additives in food, pharmaceuticals, and cosmetics. Because of their insecticidal activity [4], *Ocimum* plants are sometimes used against crop pest insects [1].

Basil is a condimental plant cultivated in some parts of Romania and it is frequently used in cuisine (food flavouring and preservation), alternative medicine, for pharmaceutical products and in the cosmetics industry [5]. *O. basilicum* (sweet basil), *O. gratissimum* (clove basil or African basil) and *O. tenuiflorum* (syn. *O. sanctum* - holy basil) are the most commonly used *Ocimum* species as medicinal and aromatic plants. Because of the importance of *Ocimum* species and of the great variability in chemical composition, their essential oils have been the object of many studies [1-3,6,7], but very little is known about basil species growing in Romania [5].

Many species of the genus *Ocimum* contain essential oils primarily based on monoterpene derivatives such as camphor, limonene, thymol, citral, geraniol, and linalool [8,9]. The site of monoterpene biosynthesis in Lamiaceae species has been specifically localized in the glandular cells of the secretory hairs [10,11]. Glandular hairs are widespread on both vegetative and reproductive organs

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