

Chemical composition and biological activity of the essential oil from the wood of *Pinus heldreichii* Christ. var. *leucodermis*

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Abstract The chemical composition of the essential oil obtained by steam distillation from the wood of *P. heldreichii*, collected from north Greece area was determined by GC and GC/MS for the first time. Forty constituents (corresponding to 96.3% of the total weight) were identified. The main components were: limonene, cembrene, longifolene, α -pinene, methyl chavicol, kaurene and cembrene A. The antimicrobial activity of the oil was evaluated against six Gram positive and Gram negative bacteria and three human pathogenic fungi, using the agar dilution technique. Strong activities against most of the tested microorganisms were exhibited. Moreover, the oil showed a very promising antioxidant activity through Rancimat method.

Chemische Zusammensetzung und biologische Aktivitäten des ätherischen Öls aus dem Holz von *Pinus leucodermis*

Zusammenfassung Das ätherische Öl aus Holz von *P. heldreichii*, (Nordgriechenland) wurde mittels Wasserdampfdestillation gewonnen und die chemische Zusammensetzung

mit GC und GC/MS analysiert. Vierzig verschiedene Inhaltsstoffe (entsprechend bis 96.3 % des Gesamtgewichts) konnten identifiziert werden. Die Hauptinhaltsstoffe waren: Limonen, Cembren, Longifolen, α -Pinen, Methylchavicol, Kauren und Cembren A. Die antimikrobielle Aktivität des ätherischen Öls wurde an sechs Gram positiven und negativen Bakterien sowie drei pathogenen Pilzen mit der Agardiffusionsmethode bestimmt. Das ätherische Öl zeigte eine deutliche antimikrobielle Aktivität gegen die meisten geprüften Mikroorganismen. Die antioxidative Wirkung des ätherischen Öls, die mit der Rancimat Methode getestet wurde, war vielversprechend.

1 Introduction

The genus *Pinus* belongs to the family Pinaceae and the monotypic subfamily Pinoideae. There are about 115 species of *Pinus* and their natural distribution ranges from arctic and subarctic regions of Eurasia and North America south to subtropical and tropical regions of Central America and Asia (Farjon 1984; Silba 1986; Rushforth 1987).

The species was first described as *Pinus heldreichii* by the Swiss botanist K. Hermann Christ in 1863 from specimens collected on Mount Olympus, and then described a second time as *P. leucodermis* in 1864; the author of the second description was the Austrian botanist F. Antoin. Some minor morphological differences have been claimed between the two descriptions (leading to the maintenance of both as separate taxa by a few botanists), but this is not supported by modern studies of the species, which show that both names refer to the same taxon and are synonyms.

Pinus heldreichii Christ. var. *leucodermis* is a forest species endemic to the Balkan peninsula and one of the least

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