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Phytochemical Characterization of the Species *Thuja columnaris* Short Communications

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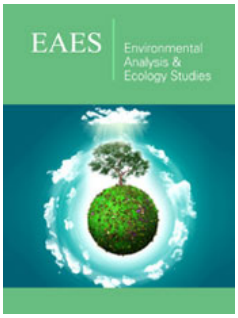

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Abstract

Thuja columnaris has been used in traditionality medicine for the treatment of rheumatism, amenorrhea, cystitis, and uterine carcinomas, and as an abortifacient and contraceptive. Several plant-derived essential oils have been known for over a century to have epileptogenic properties. A survey of the literature shows essential oils of 11 plants to be powerful convulsants (fennel, eucalyptus, pennyroyal, hyssop, sage, rosemary, tansy, savin, turpentine, thuja, and wormwood) due to their content of highly reactive monoterpene ketones, such as camphor ($C_{10}H_{16}O$), pinocamphone ($C_{10}H_{16}O$), thujone ($C_{10}H_{16}O$), cineole ($C_{10}H_{18}O$), pulegone ($C_{10}H_{16}O$), sabinyl acetate ($C_{12}H_{18}O_2$), and fenchone ($C_{10}H_{16}O$).

Keywords: *Thuja columnaris*; Essential oils; Antimicrobial activity

Background

The essential oils from leaves, twigs and stems of large trees and shrub-like trees of *Thuja columnaris* were extracted by hydrodistillation and supercritical fluid extraction, analyzed by chromatographic methods [1].

The essential oil composition differed significantly among the three organs, as well as between large trees and shrub-like trees [2]. Furthermore, many differences in the essential oil composition between *Thuja columnaris* and other Thuja species were apparent [3]. The essential oils exhibited a certain degree of antifungal activity against strains of human pathogenic fungi [4]. Chemical composition and pharmacological activity: The main compounds of the oil were the monoterpene ketones α- and β-thujone, fenchone, and sabinene, as well as the diterpenes beyerene and rimuene [5]. The neurotoxic thujones (α- and β-diastereoisomers) are common compounds of *Thuja columnaris* plant essential oils. *Thuja columnaris* has many pharmacological properties but has no anti-inflammatory activity, and contents 54.78-11.28% alpha-pinene ($C_{10}H_{16}$) and (+)-4-carene ($C_{10}H_{16}$), 6.87% alpha-cedrol ($C_{15}H_{26}O$), 5.88% terpinolene ($C_{10}H_{16}$), 5.21% p-menth-1-en-8-ol acetate ($C_{12}H_{20}O_2$), 4.04% beta-myrcene ($C_{10}H_{16}$), 2.26% beta-pinene ($C_{10}H_{16}$), 1.72% germacrene D ($C_{15}H_{24}$), 1.65% sabinene ($C_{10}H_{16}$) and 1.62% D-Limonene ($C_{10}H_{16}$) [6].

The fruit oil contained 52.4% alpha-pinene ($C_{10}H_{16}$), 14.2% delta-3-carene ($C_{10}H_{16}$), 6.5% alpha-cedrol ($C_{15}H_{26}O$) and 5.1% beta-phellandrene ($C_{10}H_{16}$), the leaf oil contained 21.9% alpha-pinene ($C_{10}H_{16}$), 20.3% alpha-cedrol ($C_{10}H_{16}$), 10.5% delta-3-carene ($C_{10}H_{16}$) and 7.2 % limonen ($C_{10}H_{16}$) as the main components [7]. The leaf oil contained 29.2% alpha-pinene ($C_{10}H_{16}$), 20.1% Delta-3-carene ($C_{10}H_{16}$), 9.8 % alpha-cedrol ($C_{15}H_{26}O$), 7.5% caryophyllene ($C_{15}H_{24}$), 5.6% alpha-humulene ($C_{15}H_{24}$), 5.4% limonene ($C_{10}H_{16}$), 3.8% alpha-terpinolene ($C_{10}H_{16}$) and 3.5% alpha-terpinyl acetate ($C_{12}H_{20}O_2$) as major compounds [8]. A phytochemical investigation on the essential oil of *Thuja columnaris* resulted in the isolation and identification of three sesquiterpenes, 3α-methoxy-4α-epoxythujopsane, Δ^{35}-4β-epoxythujopsene, and Δ^{34}-thujopsen-2,15-diol, together with eight known sesquiterpenoids. The compounds, beyerene and the mixture of alpha-thujone and beta-thujone, were isolated from the oils and tested against Gram-positive and negative bacteria and pathogenic fungi. The oils of the *Thuja columnaris* species exhibited significant antimicrobial activity, while the mixture of alpha- and beta-thujone showed very strong activity as well [9].

Conclusion

T. columnaris essential oil and its active component, α-thujone, can be used for the treatment of polycystic ovary syndrome without inducing osteoporosis. Nowadays the wide use of these compounds in certain unconventional medicines make this severe complication again possible.

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