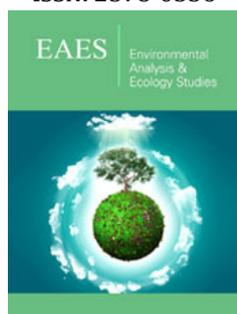


Betula Pendula: Compounds with Phytotherapy Applications

Vlad Caius Alexandru LASC, Bianca Roxana POPESCU*, Ioan SARAC and Monica BUTNARIU

University of Agricultural Sciences and Veterinary Medicine, Romania

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*1Corresponding author: Bianca Roxana POPESCU, Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania", Timisoara, 300645, Calea Aradului 119, Timis, Romania

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Abstract

Betula is a genus of some 50 species distributed throughout the northern temperate region. *B. pendula* ($2n = 28$). The geographic and ecologic specificity of Romania and other Eastern European countries has resulted in the development of an exceptional diversity of medicinal plants. The effect of birch leaf (*Betula pendula*) extract in on corneal inflammation following keratoplasty. The hepatoprotective effect of birch *B. pendula* extract on chronic hepatitis C was analysed.

Keywords: *B. pendula*; Pharmacological activity; Volatile oil; Chemical composition

Background

The sand birch is common throughout Europe. Special features are the unusual and very beautiful habit, the eye-catching bark and the light crown. It can beautify the landscape considerably (Through its white bark), symbolize hope in the gloomy time of year, and has a number of environmental benefits [1,2].

The wood finds many uses, although in Central Europe rather rare. On the other hand, it has long been of outstanding importance in Scandinavia and Eastern Europe. Other components of this tree species such as their spring juice and bark are used. *Betula pendula* is a tree that has a hard time competing against other tree species [3].

However, it can initiate succession in poorer locations over a large area, and with it, the reforestation has begun after the last ice age. However, in Central Europe it can only survive permanently in extreme locations, e.g. on rocks. In forestry, until recently, it still had the reputation of the "Weed", but in the meantime, ecologically oriented silviculture has recognized a number of positive characteristics [4]. In the city, the sand birch by their many and far-flying fruits is unpopular with allergies by their pollen.

Chemical Composition and Pharmacological Activity

The main components (by hydrodistillation and microdistillation, respectively) found were 12% and 10% alpha-copaene ($C_{15}H_{24}$), 11% and 18% germacrene D ($C_{15}H_{24}$) and 11% and 15% delta-cadinene ($C_{15}H_{24}$) in the analyzed essential oils. Diarylheptanoids have been the center of the intensive research efforts for Alzheimer's disease and other neurodegenerative diseases. The *B. pendula* extract showed significant anti-inflammatory activity [5].

Many cartilage protective agents have been developed from natural products, and they have resulted in the development of treatments for osteoarthritis, so determined the osteoarthritic efficacy and mechanism of butanol fraction from the bark of *B. pendula* in collagenase-induced rabbit model of osteoarthritis [6].

The major components of the volatile oil from the inner bark of *B. pendula* were trans 31% alpha-bergamotene ($C_{15}H_{24}$) 19% and alpha-santalene ($C_{15}H_{24}$), 18% alpha-bergamotene ($C_{15}H_{24}$), 12% ar-curcumene ($C_{15}H_{22}$), 12% E-beta-farnesene ($C_{15}H_{26}$), 10% Z-beta-farnesene ($C_{15}H_{24}$) and 8% cis-alpha-bergamotene ($C_{15}H_{24}$). Other compounds is 14-hydroxy-beta-caryophyllene ($C_{15}H_{24}O$), beta-betulenol ($C_{15}H_{22}O$), 14-acetoxy-beta-caryophyllene ($C_{17}H_{26}O_2$),

14-hydroxy-isocaryophyllene (14-HO-C₁₅H₂₄) and its acetate (C₂H₃O₂), alpha-betulenol acetate (C₁₇H₂₆O₂), beta-betulenol (C₁₅H₂₄O) and beta-betulenol acetate (C₁₇H₂₆O₂); with antimicrobial activity [7].

The hemolytic activity of the epoxydammarane triterpenoids isolated from the genus *Betula* and their semi-synthetic derivatives was investigated. Comparative studies of epoxydammarane triterpenoid activities at pH 5.5 and 5.0 and at 37 and 42 °C showed that 3-oxo, 3,11-dioxo, 3- and 11-acetoxy, as well as 3,11-diacetoxy (C₂₅H₄₀O₅) derivatives had hemolytic potencies lower than the corresponding polyols; triterpenoids (C₃₀H₄₈O₇S) with a 3alpha-OH group were stronger than their analogues with a 3 beta-OH group; epoxydammaranetriols were somewhat more potent than epoxydammaranediols [8]. Triterpenoids esterified with malonic acid at C-3 possessed the strongest hemolytic activity among the tested compounds [9].

The most representative example, which justifies this Short Communications is the title "Assessment report on *Betula pendula* Roth and/or *Betula pubescens* Ehrh. as well as hybrids of both species, folium" [10].

Conclusion

B. pendula extract is a promising anti-inflammatory product to treat corneal inflammation. The standardized extract of *B. pendula* may ameliorate memory deficits by activating the response element-binding protein activation-response element-binding protein (CREB) activation (CREB-BDNF) pathway and prevent a neurodegeneration by inhibiting neuronal cell death. Data suggest that extract of *B. pendula* has shown the protective effect on cartilage alternations through balance of MMPs/TIMP-1 and regulates inflammatory-related molecules *in vivo* model of osteoarthritis, and great candidate for development of osteoarthritis treatment.

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