

Serbian Plant Physiology Society

Institute for Biological Research „Siniša Stanković”, University of Belgrade

1st International Conference
on Plant Biology
20th Symposium of the
Serbian Plant Physiology Society

Programme and Abstracts



Hotel PATRIA, Subotica, June 4-7, 2013

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Superoxide anion radical scavenging capacity of the diterpene alcohol phytol

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Cardiovascular diseases are the leading cause of death in adults worldwide. Since reactive oxygen species (ROS) are directly linked to cardiovascular diseases antioxidant agents can treat the relevant oxidative pathologies by neutralising ROS, chelating catalytic metals and acting as oxygen scavengers. Preliminary analysis of the moss *Rhodobryum ontariense* volatiles has indicated diterpene alcohol phytol (3,7,11,15-tetramethyl-2-hexadecen-1-ol) as its main chemical constituent (31.95%). Such abundance has not previously been reported in other mosses. Bearing in mind the claims of traditional Chinese medicine that mosses of *Rhodobryum* species (Bryaceae) can cure cardiovascular diseases as crude drugs, the aim of this study was to estimate the anti-superoxide anion radical activity of phytol in *in vitro* conditions, by electron paramagnetic resonance (EPR) and fluorescent spectroscopy (FS), for the aforementioned medicinal reasons. The results have shown a moderate potential of phytol (23% by EPR & 15% by FS) to eliminate superoxide anion radical, although the tested concentration has been 0.1 mM. It can be concluded that further investigations related to this compound could be beneficial for the treatment of cardiovascular diseases, especially since this compound can be freely found in numerous food products. Finally, phytol and/or its derivatives may inspire new therapies in heart medicine that indicating volatiles could be used as bioactive natural products offering additional solutions in this field. This work was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (grants No. 173040, III 41005 and III 45012).

Secoiridoid content and hepatoprotective activity of *Gentiana cruciata* L. root extract

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Gentiana plants are best known for their bitter taste that is due to the secoiridoids (e.g. swertiamarin, gentiopicrin, sweroside and amarogentin). Secoiridoid glucosides, gentiopicrin, swertiamarin and sweroside, are present in various traditional medicine preparations and are reported to have hepatoprotective activity. Many

Gentiana species are known for their pharmaceutical values, such as *Gentiana cruciata* L., commonly called cross gentian. The dried roots and above-ground parts of *G. cruciata* are consumed in the Balkan region as herbal tea or a medicinal wine for loss of appetite, as a stomachic and component in preparations showing beneficial effects in gall and liver diseases. This study using *in vivo* model investigates hepatoprotective activity of the methanol extract of *G. cruciata* root (GCR) against carbon tetrachloride-induced liver injury in rats. Wistar rats were orally pretreated with GCR (100, 200, and 400 mg/kg) and silymarin (100 mg/kg) for seven days before they were treated with CCl₄ (1 ml/kg, 1:1 mixture in olive oil) which caused liver injury. Pretreatment with GCR dose-dependently and significantly ($p < 0.001$) decreased levels of serum transaminases, alkaline phosphatase and total bilirubin, whereas an increase was found in the level of total protein compared with CCl₄-treated group. In the liver tissue antioxidant studies, we found a significant increase in the levels of catalase, superoxide dismutase and reduced glutathione, whereas there was marked reduction in the levels of thiobarbituric acid-reactive substances, as compared to CCl₄ treated group. Histological analyses also show that GCR reduced the incidence of liver lesions including necrosis, ballooning degeneration and micro- and macrovesicular changes induced by CCl₄ in rats. The main secoiridoid compounds (sweroside, swertiamarin and gentiopicrin) present in GCR were identified and quantified to gain an insight into the compounds responsible for its hepatoprotective effects. The HPLC assay clearly indicated that GCR contained the greatest concentration of gentiopicrin (5.45%), whereas concentration of sweroside (0.29%) and swertiamarin (0.09%) were lower. This research was supported by the Ministry of Education, Science and Technological development of the Republic of Serbia (grant No. III 43004).

***In vitro* antioxidant activity of methanol extract of *Bergenia cordifolia* rhizome**

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The species belonging to the genus *Bergenia* are herbaceous, perennial plants mainly distributed in Asia, Siberia and Europa. *Bergenia cordifolia* (fam. Saxifragaceae), like all *Bergenia* species, contain various biologically active compounds in their roots, leaves, stems and flowers, which can be mainly classified into three categories, including simple phenols, flavonoids and quinines. The preparations of these plants are used as astringent, anti-inflammatory, bactericidal, haemostatic, immunomodulatory, antiulcer, antihepatotoxic, antifungal, antiarrhythmic preparations. In folk medicine these remedies are used for disinfecting, wound healing, tonic and general strengthening purposes.

In this study was investigated antioxidant activity of methanol rhizome extract of *B. cordifolia*, as well as the amounts of total phenols, flavonoids and flavonols. The content of total phenolics in the extract was determined according to the Folin-Ciocalteu procedure, while the total flavonoid and flavonol contents were determined with spectrophotometric methods with AlCl₃ reagent. Antioxidant activity of methanol extract of *B. cordifolia* rhizome was evaluated in a series of *in vitro* assays involving free radicals and reactive oxygen species (total antioxidant capacity, DPPH free radical scavenging ability, ABTS⁺ radical cation scavenging ability and superoxide radical scavenging assay) and IC₅₀ values were determined.

The tested extract showed high total phenolic content (559.47 mg GA/g) and lower amounts of flavonoids (4.31 mg RU/g) and flavonols (11.48 mg RU/g). Investigated extract showed high level of total antioxidant activity (1313.41 mg AA/g). Tested extract expressed a strong antiradical activity in the DPPH assay (IC₅₀ = 12.12 µg/mL), in the ABTS⁺ radical cation assay (IC₅₀ = 7.73 µg/mL) and in the superoxide radical scavenging assay (IC₅₀ = 28.16 µg/mL), compared to natural antioxidants such as gallic acid, ellagic acid, quercetin and rutin. High level of antioxidant activity showed that *B. cordifolia* might prevent oxidative damages to biomolecules. The results obtained suggest that extract has promising as strong natural antioxidant.