

Serbian Plant Physiology Society

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

# 2<sup>nd</sup> International Conference on Plant Biology

## 21<sup>th</sup> Symposium of the Serbian Plant Physiology Society

### COST ACTION FA1106 QUALITYFRUIT Workshop



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## The influence of elicitors yeast extract and chitosan on xanthone accumulation in hairy root culture of *Gentiana dinarica* Beck.

PP4-10

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Continuing studies of secondary metabolites in root cultures of *G. dinarica*, we examined the effects of biotic elicitors, yeast extract and chitosan on the xanthone production in A4 M70GUS transformed roots. Hairy roots were maintained in 40 mL liquid ½ MS plant growth regulator-free medium. Hairy roots were treated with 1, 2 and 5 g L<sup>-1</sup> yeast extract, or 5, 10, 20, 50, 100 and 200 g L<sup>-1</sup> chitosane. Cultures were harvested after three or seven days of elicitor treatments. Air dried hairy roots were extracted with methanol and analyzed using HPLC-DAD method. Two xanthenes, norswertianin-1-O-primeveroside and norswertianin were identified and quantified. Both yeast extract and chitosan influenced the growth of the roots, as well as the production and accumulation of xanthenes. The root growth index and content of xanthone norswertianin-1-O-primeveroside decreased with increasing concentration of both elicitors. On the contrary, increased elicitor concentration stimulated the production of xanthone aglycon norswertianin. At higher concentrations (50, 100 and 200 g L<sup>-1</sup>), chitosan had a more pronounced effect on growth index and xanthone accumulation than the yeast extract. At highest concentrations, both elicitors induced necrosis in hairy root cultures.

**Keywords:** *G. dinarica*, elicitors, xanthone, hairy roots

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## The relationship of physicochemical properties and structure to the antioxidative activity of free amino acids in the aqueous Fenton system

PP4-11

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Iron is essential for plant growth, metabolism of mitochondria and chloroplasts, and a wide assortment of enzymes. However, it is also involved in Fenton reaction that generates hydroxyl radical (HO•), the most reactive species in plants. The aim of our study was to examine the effects of amino acids on HO• production. The rank order according to antioxidative activity (AA) of amino acids in Fenton system was: Trp > Phe, Leu > Ile > His > Arg > Val > Lys, Tyr, Pro > Gln, Thr, Ser > Glu, Ala, Gly, Asn, Asp. Sulfur-containing amino acids generated different secondary reactive products, which were discriminated by EPR spin-trapping spectroscopy. AA showed positive correlation with hydrophobicity and negative correlation with polarity. HO•-provoked oxidation of amino acids was strongly positively affected by hydrophobic hydration. Group contribution method showed that the reactivity of amino acids with HO• is defined by the properties of side-chains (the contri-

bution of  $\text{NH}_3^+\text{CHCOO}^-$  group and antioxidative activity of Gly were next to zero). Our results might shed a new light on the role of iron in the regulation of free amino acids pool and on protein oxidation in plants. According to our findings, native proteins (with exposed polar residues) might not be particularly susceptible to oxidation by  $\text{HO}\cdot$ . But once a protein is damaged and partially denatured it exposes hydrophobic side-chains and might become a likely target for  $\text{HO}\cdot$ , thus potentially acquiring an antioxidative role. Further research on change of redox properties of proteins with denaturation is warranted.

**Keywords:** amino acids, antioxidant, hydroxyl radical, EPR

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## Essential oil composition of *Centaurea murbeckii* Hayek - endemic Balkan species

PP4-12

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The composition of essential oil isolated from fresh capitula of *Centaurea murbeckii* Hayek (Asteraceae), an endemic species of the Balkans (Mt. Zelengora, BIH), was analyzed. This is the first report of essential oil composition of this taxon. Essential oil was obtained by simultaneous distillation extraction, using Likens–Nickerson type apparatus. The oil was analyzed by gas chromatography–mass spectrometry (GC-MS). In total, 76 compounds were identified, representing 98.9% of the total oil. The main constituents were: Germacrene D (14.15%), 2-ethylhexyl isohexyl ester phtalic acid (9.83%) and (*E*)-caryophyllene (9.74%). The essential oil was dominated by sesquiterpenes (53.9%): sesquiterpene hydrocarbons and sesquiterpene oxygenated (31.7%, 22.2%, respectively). Other compounds (aliphatic hydrocarbons, aliphatic aldehydes and alcohols, aliphatic acids and their esters and aldehydes, aromatic esters and aliphatic acids, alkyl aromatic alcohols, aryl esters of aromatic acids) represented 35.1% of the essential oil. According to our results and literature data, essential oils of most *Centaurea* species were characterized with Germacrene D as a dominant constituent. According to our previous investigations, this compound is not present in some *Centaurea* species from the Balkan Peninsula. Future investigation of *Centaurea* species is planned to show range of variability in essential oil composition and especially Germacrene D content and their taxonomic utility.

**Keywords:** *Centaurea murbeckii*, Asteraceae, essential oil, Germacrene D