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Scientific Conference  
PLANT PHYSIOLOGY AND GENETICS  
ACHIEVEMENTS AND CHALLENGES



Organised by  
INSTITUTE OF PLANT PHYSIOLOGY AND GENETICS  
BULGARIAN ACADEMY OF SCIENCES

## CONFERENCE PROGRAM AND BOOK OF ABSTRACTS



Plant Physiology and Genetics  
Achievements and Challenges

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## P-35-T1

SUCROSE-RELATED EFFECTS ON SHOOT DEVELOPMENT AND DOUBLE-PHASE CULTIVATION OF *RUSCUS ACULEATUS* L.

Ivanova I., Dimitrova D., Gussev Ch., Bosseva Y., Stoeva T.

Institute of biodiversity and ecosystem research, Bulgarian Academy of Sciences, Sofia, Bulgaria

**Keywords:** Asparagaceae, cytometry, liquid culture, micropropagation.

*Ruscus aculeatus* is an economic plant species with remarkable shade and drought tolerance. The slow growth habit and specific growing requirements hinder its frequent field cultivation. Furthermore, micropropagation of *R. aculeatus* is greatly influenced by determined shoot growth and choice of the source material (origin and explant type). Here we present trials to stimulate the propagation and the growth of micropropagated *R. aculeatus* shoots by modification of carbon source (sucrose) and cultivation in double-phase system. Propagation rate and shoot development were assessed and genome size stability of the regenerants was verified by flow cytometry. Excess of sucrose in the media hampered shoot proliferation and development. Lowest concentrations were more suitable for shoot induction and even for root growth, contrasting with the overall view on the stimulating effect of the carbon sources on rhizomatous species. Obtained shoots performed a normal morpho-physiological habit, developing mostly non-branched stems with typical cladodes. The unaffected genome size status of the regenerants was also confirmed. Double-phase cultivation was effective only in medium without growth regulators that supported better shoot growth. However, the propagation rates were not higher than on agar. The obtained results present useful insights on the micropropagation of *R. aculeatus* that could reduce production and conservation costs.

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Presenting author: tai@bio.bas.bg



## P-36-T1

TERPENOID BIOGENESIS IN *IN VITRO* ARTEMISIA ALBA TURRA PLANTS IS RELATED TO ENDOGENOUS CYTOKININ BALANCE AND STRUCTURAL ORGANIZATION OF THE PHOTOSYNTHETIC APPARATUSKrumova S.<sup>1</sup>, Andreeva T.<sup>1</sup>, Motyka V.<sup>2</sup>, Dobrev P.<sup>3</sup>, Todorova M.<sup>3</sup>, Trendafilova A.<sup>3</sup>, Evstatieva L.<sup>4</sup>, Danova K.<sup>1</sup><sup>1</sup>Institute of Biophysics and Biomedical Engineering, BAS, 1113 Sofia, Bulgaria<sup>2</sup>Institute of Experimental Botany AS CR, Prague, Czech Republic<sup>3</sup>Institute of Organic Chemistry with Centre of Phytochemistry, BAS, 1113 Sofia, Bulgaria<sup>4</sup>Institute for Biodiversity and Ecosystem Research, BAS, J. Gagarin 2, Sofia 1113, Bulgaria**Keywords:** *Artemisia alba*, terpenoid biogenesis, structural characterization of photosystem II, thylakoid membranes, endogenous biogenesis.

The vital physiological functions of many terpenoids in the plant organism as well as the valuable pharmacological activities of numerous representatives of these compounds impose the challenge to understand better factors affecting terpenoid biogenesis and identify possible tools for targeted biotechnological terpenoid delivery. Our previous research showed that terpenoid profile of the essential oils of *Artemisia alba* Turra was strongly affected by the morphogenetic changes induced by the auxin and cytokinin supplementation to the plants grown *in vitro*. In the present work, the structural organization of the photosynthetic apparatus of *Artemisia alba* *in vitro* was studied after different treatments with exogenous plant growth regulators (PGRs). Relations have been made between the terpenoid profile of essential oils and the content of endogenous cytokinins in the aerial and underground plant parts. PGR treatments resulted in major structural changes in the thylakoid membranes such as lowered LHClI amount and smaller PSII supercomplexes. Predominance of sesquiterpenoids in the essential oils was related to the most prominent manifestation of this effect and was apparently linked to high diversity in the morphological parameters such as area and height of thylakoid membranes, implying possible disturbance of chloroplast ultrastructure. Moreover, predominance of sesquiterpenoids was also associated with a drop of bioactive cytokinins (free bases and ribosides) in the aerial plant parts. As known, the activity of the mevalonate-independent pathway of terpenoid biogenesis is involved in the biosynthesis of plastic terpenoids, including monoterpenes, diterpenes and carotenoids. The

predominance of sesquiterpenoids in the essential oils of the *in vitro* cultured plants with impairment of chloroplast ultrastructure might possibly be explained by affecting the functionality of this pathway in *Artemisia alba* *in vitro* plants. The understanding and utilization of this effect might serve as a practical tool for the production of essential oils with pre-determined chemical composition by this plant species.

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Presenting author: k\_danova@abv.bg



## P-37-T1

## COMPARISON OF ANTIRADICAL ACTIVITY AND TOTAL PHENOLIC CONTENT IN SOYBEAN SEEDS BY APPLYING DIFFERENT EXTRACTION SOLVENTS

Nikolova M.<sup>1</sup>, Dimitrova M.<sup>1</sup>, Tasheva K.<sup>2</sup>, Todorova R.<sup>3</sup>, Ravishankar G.<sup>4</sup>, Kosturkova G.<sup>2</sup><sup>1</sup>Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria<sup>2</sup>Institute of Plant Physiology and Genetics, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria<sup>3</sup>Experimental Station in Soya DP Pavlikeni, 5200 Pavlikeni, Bulgaria<sup>4</sup>Dayananda Sagar Institutions, 560078 Bangalore, India**Keywords:** Glycine max, DPPH, phenols.

Antiradical activity and total phenolic content of soybean seeds from several varieties were analyzed using different type of extraction solvents. Acetonitrile (ACN) acidified with HCl and 80% methanol were used as extraction solvents. The amount of phenolic compounds in the extracts was estimated by Folin-Ciocalteu reagent. 2,2-diphenyl-1-picrylhydrazyl (DPPH) radicals were used for evaluation of antioxidant activity. Statistically significant differences ( $p > 0.05$ ) in respect of total phenolic content and antiradical activity among the studied methanolic and acetonitrile extracts were not established. Total phenolic content in soybean varieties ranged from 8.025 to 10.96 mg GAE/g extract. Among the studied cultivars Daniela, Richi and Rosa showed higher levels of phenols. Antiradical activity expressed as concentration of extracts needed for 50% inhibition of radicals ( $IC_{50}$ ) ranged from 2.29 to 3.91 mg/ml. The obtained results showed that methanol and acetonitrile are interchangeable extraction solvents when referring to a comparative analysis of antiradical activity and total phenolic content of soybean samples.

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Presenting author: gkosturkova@abv.bg



## P-38-T1

EFFECT OF CULTURE MEDIA COMPOSITION ON THE GROWTH AND ASTAXANTHIN PRODUCTION IN *HAEMATOCOCCUS PLUVIALIS*

Gacheva G., Cohen J., Pilarski P.

Institute of Plant Physiology and Genetics - BAS, Acad. G. Bonchev Str. Build. 21, Sofia 1113, Bulgaria

**Keywords:** Astaxanthin, growth, *Haematococcus*, nutrient media.

World needs of carotenoids, as natural dyes and nutraceuticals, are continuously growing whereas the demands for biotechnologically synthesized pigments (astaxanthin, canthaxanthin, lutein etc.) are also increasing. The green microalga *Haematococcus pluvialis* is one of the world's best and biggest producers of natural astaxanthin. Stress conditions stimulate high astaxanthin accumulation in its cells – up to 4% of dry weight. The aim of this work was optimizing the cultivation conditions for growth and astaxanthin production in *Haematococcus pluvialis* (Flow et al., 1979). The alga was grown in different culture media: BG<sub>11</sub> (Rippka et al., 1979); BG<sub>11</sub> + 1 g/l NaHCO<sub>3</sub>; modified BG<sub>11</sub> (Boussiba & Vonshak, 1991); modified BG11 + 1 g/l NaHCO<sub>3</sub> and medium after Setlik (1967), modified by Georgiev et al. (1978) with 1% concentration of nutrients.

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Presenting author: gergana\_gacheva@abv.bg