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MECHANISMS OF ADAPTATION OF LIVING SYSTEMS

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INTERDISCIPLINARY INTERACTION FOR THE BIOTECHNOLOGICAL DEVELOPMENT OF BALKAN MEDICINAL PLANT SPECIES

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Aim: Develop biotechnological approaches for the controlled delivery of biologically active compounds of medicinal and aromatic plants characteristic for the Balkan region.

Material and methods: Investigated plant species were chosen on an ethnobotanical principle. Representatives of the *Hypericum* and *Pulsatilla* genera, *Sideritis scardica* Sofia 2 cultivar, *Inula britannica*, *Artemisia alba* were collected from Bulgaria. Tissue culture initiation and media optimizations were performed at the facilities of the Institute of Organic Chemistry with Centre of Phytochemistry, BAS. Polyphenolic contents, enzymatic activities, molecular markers of oxidative stress were measured spectrophotometrically. Structural and functional alterations of photosynthetic membranes were characterized by 77 K fluorescent microscopy, electrophoretic profile by 10% SDS-PAGE. Essential oils were prepared by micro-steam distillation and non-volatile chemical constituents by ultrasonic extraction.

Results and Discussion: Through modification of plant growth regulators supplementations and vitamin content, optimizations were achieved affording stimulation of polyphenolic content in the *in vitro* cultured plants. Studies of physiological status provided evidence of interrelations between enzymatic and non-enzymatic defense of the plants regarding polyphenolics biosynthesis *in vitro*. Three different culture systems were established for production of essential oils with modified terpenoid profile for *A. alba*. Physiological studies indicated relations between morphogenetic response to plant growth regulators, structure and function of photosystem II and electrophoretic profile of the plant.

Conclusions: Obtained results will be used for scientifically based targeted delivery of plant material with defined secondary metabolite profile. Further research is in progress to evaluate the potential biological activity of extracts, fractions and individual compounds of the studied *in vitro* culture systems.

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Keywords: *in vitro* culture optimization, secondary metabolite production, Balkan medicinal and aromatic plants