

R E P O R T

regarding the thesis for scientific degree "Doctor of Science" professional field 4.3. "Biological Sciences", scientific specialty "Plant Physiology"

Author of the thesis: Prof. Dr. Violetta Borisova Velikova, Institute of Plant Physiology and Genetics, Bulgarian Academy of Sciences

Topic: Physiological role of biogenic isoprene in plants

Assessor: Prof. Dr. Emilia Lyubomirova Apostolova, Institute of Biophysics and Biomedical Engineering, Bulgarian Academy of Sciences

The thesis of prof. Velikova summarizes results from studies to clarify the physiological role of biogenic isoprene for the plant resistance against abiotic stress as well as possible mechanisms associated with its protective role. Biogenic isoprene released from plants plays an important role in atmospheric chemistry and air quality. Three hypotheses about the role of isoprene for tolerance, response and protection of plants under stress are formulated in the thesis. Evidence of the high quality of the experimental results included in the thesis is their publication in prestigious international journals. The achievements of 20 scientific publications (19 in Q1 and 1 in Q2), which are cited 1326 times, have been summarized in the thesis. Seven of these publications (in Q1, cited 95 times) are not included in the habilitations for associate professor and professor. Different research approaches (physiological, biochemical, biophysical and structural studies) have been used in the thesis, which contribute to clarify the role of biogenic isoprene for a higher resistance of plants to adverse environmental factors.

The thesis consists of 422 pages, illustrated with 67 figures and contains: introduction (2 pages), literature review (16 pages), goals, hypotheses and tasks (2 pages), research approaches and methods (6 pages), results and discussion (96 pages), conclusion (2 pages), achievements (4 pages), cited literature (379 references are cited) and the publications included in the thesis. The investigations involved in the dissertation are a result of funding for international (LSD.CLG, EAP.RIG, Bilateral Projects with Italy and Hungary) and national (Bulgarian National Science Fund, Ministry of Education and Science) projects, as well as individual fellowships (from NATO, Maria Curie EC and the Alexander von Humboldt Foundation) of Prof. Velikova.

Summary of the thesis consists of 78 pages and correctly reflects the essence of the thesis.

Based on the results included in the thesis, 15 achievements related to the acquisition of new data and are essential to clarify the role of isoprene in abiotic stress conditions have been formulated. Under conditions of ozone stress, endogenous isoprene limits the accumulation of hydrogen peroxide and reduces lipid peroxidation of cell membranes. The experimental data indicate a relationship between isoprene emission and the lipid composition of thylakoid membranes as well as its influence on the chloroplast ultrastructure and support the hypothesis of the membrane-stabilizing role of isoprene. Data presented in the thesis reveal that isoprene has a role in indirect regulation of the formation of reactive oxygen species (ROS) by controlling the S-nitrosylation levels of ROS metabolizing enzymes. It is also of great importance that the investigations show not only the protective role of isoprene during heat stress and drought, but also its role in the rapid recovery of plants after stress termination. Experimental evidences also show that in ecotypes, adapted to harsher conditions, the enhanced biosynthesis of isoprenoids has contributed to the protection of photosynthetic membranes during drought and enhances their recovery after rehydration. Original experimental evidence has also been obtained showing the role of isoprene in reducing the inhibition of photosynthesis by high doses of nickel.

Conclusion

The thesis of Prof. Violeta Velikova includes up-to-date and in-depth researches with original scientific achievements that have received a wide international response. The dissertation work, according to the actuality of the developed problem, the quantity and quality of the included experimental data and the significance of the achievements, fully exceed the minimum requirements of the ADASRB as well as the requirements, specified in the Regulations for the implementation of ADASRB in the IPPG – BAS. Based on the mentioned above, I strongly recommend to the Academic Board to award of Prof. Violetta Borisova Velikova scientific degree "Doctor of Science" professional field 4.3. "Biological Sciences", scientific specialty "Plant Physiology".

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Sofia

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