

OPINION

Regarding the competition for the academic position „Associate Professor“, field of higher education 4. „Natural Sciences, Mathematics and Informatics“, professional direction 4.3. „Biological Sciences“ (Scientific specialty “Biophysics”), announced in State Gazette issue 21/07.03.2023, for the needs of department „Photoexcitable membranes“ at IBPhBME-BAS

Author of the opinion – Prof. Sashka Krumova, PhD, IBPhBME-BAS, member of the scientific jury, appointed by order № 242/06.04.2023 of the Director of IBPhBME-BAS

Sen. Assist. Prof. Martin Stefanov is the sole candidate in the announced competition. His professional crier is tightly related to IBPhBME-BAS and in particular with the department of „Photoexcitable membranes“, where he works and develops his carrier from specialist in Biology (in year 2013) to Sen. Assist. Prof. (in year 2019 untill now). He successfully defends his PhD thesis in “Biophysics” in the same department in year 2018. His working experience in this speciality is 6 years and 10 months.

For the purpose of the competition, Dr. Stefanov presents 8 publications in journals within quartile Q1, 3 - in Q2, 4 - in Q3, 1 - in Q4 and 1 published book chapter. He is first author of 8 of the articles (including 1 review). Dr. Stefanov had participated in 13 scientific projects, and was a project leader in 5 of them. He also participated in 3 international projects with collaborators from the Slovak Republic and Egypt. His scientific results are presented in 39 scientific forums, 13 of which international. This is a clear indication for activity and independence in the performance of high quality scientific work. The presented science metric indicators exceed the minimum required ones according the *Act on Development of the Academic Staff in the Republic of Bulgaria* as well as the *Regulations for its application approved by IBPhBME-BAS*.

The main achievements of the candidate, presented in the *Extended habilitation reference*, are related to application of biophysical and physiological approaches for characterization of photosynthetic membranes of higher plants, algae and cyanobacteria in the conditions of different abiotic stresses, such as salination, drought, heavy metals, low temperature and high light intensity, as well as presence of herbicides and nanoparticles. Since those types of stresses can well be encountered in the nature due to human activity and climatic

change, the investigation of the capability of different economically important photosynthetic organisms to cope with them, as well as the mechanisms by which this occurs, represents an important scientific question worldwide. Several economically important crops were investigated, such as corn, sorghum, pea, wheat, rice, as well as *Chlorella*, cyanobacteria and two lines of Paulownia, at different experimental conditions.

The most significant part of the investigations is related to the effect of salination on the structural and functional changes in the photosynthetic apparatus of C3 and C4 plants. Besides those fundamental processes, the studies are also concentrated on 2 more practical applications: (a) the possibility of utilization of nanoparticles (ZnO and ZnO-Si) for mitigation of the harmful effects of salination; (b) the resistance of different lines of Paulownia (hardwood tree species that has been intensively used for landscaping in recent years) against salt stress; the more resistant and therefore more suitable for cultivation and phytoremediation of salt soils in urban conditions line is established. This demonstrates that Dr. Stefanov is well familiar with the contemporary directions of photosynthesis research and the application of fundamental knowledge for solving specific global problems.

Other directions of research include:

- Sensitivity of photosystem II of *Chlorella* and cyanobacteria towards herbicides; the presented data are relevant for development of biosensors.
- Exogenous application of the phytohormone salicylic acid in rice cultivars on the structure and function of photosynthetic membranes in physiological conditions and cadmium stress. It is shown that treatment with 10 μ M salicylic acid stimulates the synthesis of chlorophyll and the photochemical activity of the photosystems, and in this way significantly mitigates the harmful effects of cadmium stress.
- Role of electron-transport pathways, which are alternative to the linear mechanism of electron transfer in the photosynthetic apparatus, in conditions of combined stress of low temperature and high light intensity, in the model plant *Arabidopsis thaliana*. It is demonstrated that for the *lut2*-mutant the contribution of the PGR5-dependent electron transport to the photosynthetic efficiency is not strongly expressed, while the PTOX-mediated transport of electrons towards O₂ plays more significant role in the response of the action of the two stress factors.
- Role of nitrogen nutrition of wheat in heavy metal (cadmium) stress. It is established that the uptake and distribution of Cd ions in the plant tissues strongly depends on the plant genotype. It is suggested that the allele (*Rht8*) plays important role for the neutralization of Cd

ions, which serves as significant strategy for coping with the negative impact of heavy metals application during nitrogen fertilization.

The most recent investigations of the candidate are related to the study of the antitumor and antioxidant activity of the Bulgarian herb *Sideritis scardica* from the Trigrad region, Rhodopa mountains. It is established that the hydro-ethanolic extract from the plant has high content of flavonoids and polyphenols, as well as high activity of antioxidants and free radicals, inducing cell specific and concentration dependent cytotoxicity. This demonstrates expansion and enrichment of the scientific interests of Dr. Stefanov, which is a valuable quality for the position of “Associate Professor”.

As a certain criticism of the presented habilitation report, the lack of clearly defined and separated contributions in a separate paragraph or section can be pointed out. Rather, they are mentioned in the various scientific topics investigated by the author. Also, a presentation of a vision for future research would have enriched the habilitation reference. However, this does not reduce the scientific value of the conducted research and the generally good impression of the presented documentation for the competition.

Conclusion:

Dr. Martin Stefanov is without doubt qualified in the field of biophysics and physiology of photosynthetic processes, substantiated by renown scientific publications and citations, exceeding the minimal criteria, defined in the *Act on Development of the Academic Staff in the Republic of Bulgaria* as well as the *Regulations for its application approved by IBPhBME-BAS*. His scientific interests are fully in line with the needs of department “Photoexcitable membranes” and, in my opinion, his future work will contribute significantly for the development of the photosynthesis research in Bulgaria.

Based on the above, I express a positive assessment and recommend with confidence to the esteemed members of the scientific jury to elect Sen. Assist. Prof. Martin Stefanov for the academic position “Associate Professor” at the IBPhBME-BAS.

Data: 08.06.2023

Signature:..

/Prof. Sashka Krumova, PhD/