

OPINION

Regarding the competition for the academic position „Associate Professor“, area of higher education 4. „Natural Sciences, Mathematics and Informatics“, professional field 4.3. „Biological Sciences“ (Scientific specialty “Biophysics”), announced in State Gazette issue 69/16.08.2024, 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 № 1352/14.10.2024 of the Director of IBPhBME-BAS

Sen. Assist. Prof. Georgi Rashkov, the sole candidate in the announced competition, has been working in the department of „Photoexcitable membranes“ at IBPhBME-BAS since 2006. In the period 2014-2019 he worked on and successfully defended his PhD degree in „Biophysics“. His total work experience in this specialty is 22 years and 4 months. His scientific achievements are published in a total of 21 articles (cited 225 times), and he presents 16 of them for the purpose of the current competition. Dr. Rashkov is a participant in 10 scientific projects and has presented his scientific results at 22 scientific events, which evidences scientific activity and collaboration with other colleagues from the country and abroad.

For the present competition, the applicant submits 11 articles with an impact factor/rank and Q1 (first author in two of them), 2 - with Q2, 1 - with Q3 and 2 - with Q4, as well as 42 citations, thus surpassing the minimum national requirements for occupying the academic position “Associate Professor”, as well as the specific requirements specified in the Regulations for the implementation of the Act on the development of the academic staff in the Republic of Bulgaria at IBPhBME-BAS.

The habilitation reference for scientific contributions presented by Dr. Rashkov is focused on characterization of the photosynthesis process in different photosynthetic organisms and their response to various stress factors and nanoparticles, by means of biophysical methods based on chlorophyll fluorescence (pulse modulated fluorimetry and JIP test). Two main scientific areas are defined, and detailed information on the candidate's contributions is presented for each of them:

Scientific area 1. Study of the influence of abiotic stress factors on the photosynthetic apparatus and the mechanisms of its adaptation in different plant species, cyanobacteria and green algae. Chlorophyll a fluorescence methods (PAM and JIP test) for analysis of the photosynthetic apparatus.

The effect of salinity, drought, UV radiation, high temperature and oxidative stress on photosynthetic activity in different types of organisms are characterized in detail, and the main contributions are related to:

- characterization of the efficiency of photosynthesis (photochemical activity and size of photosystems, size of the plastoquinin pool, degree of oligomerization of the light-harvesting complex of photosystem 2, speed of linear electron transfer, function of the oxygen evolving complex) under physiological conditions and upon salt stress. The studies are carried out on pea, maize, sorghum and two salinity-tolerant *Paulownia* lines, and help to reveal the mechanisms of adaptation of different plant species to salt stress;
- comparison of the response to drought in maize and sorghum, and demonstration of a different mechanism for dissipation of the excess light energy in the two plant species, which could serve for assessment of the plant tolerance to this stress factor;
- establishment of higher sensitivity of photosystem 2 in *Synechocystis salina* than in *Chlorella vulgaris*, after UV-B treatment;
- demonstration of higher sensitivity of photosystem 2 α centers of pea plants at high temperature and fluridone application;
- establishment of reduced photochemical activity of photosystem 2 upon application of sanosil to the green alga *Chlorella vulgaris* and the cyanobacterium *Synechocystis salina*, isolated from Antarctic and mesophilic environments.

Scientific area 2. Role of exogenously applied signaling molecules and nanoparticles under physiological conditions and under abiotic stress in different plant species.

The influence of nitric oxide, zinc oxide nanoparticles, brassinosteroids and microalgae on the efficiency of photosynthesis under physiological conditions and under abiotic stress has been established, and the main contributions are related to:

- determination of the effects of sodium nitroprusside (as a nitric oxide donor), 24-epibrassinolide and synthetic zinc oxide nanoparticles (bare and silica-coated) on the functions of the photosynthetic apparatus in higher plants;
- demonstration of a protective role of sodium nitroprusside and zinc oxide nanoparticles in salinity conditions;

➤ improvement of the functionality of the photosynthetic apparatus of rice plants in conditions of cadmium pollution, in the presence of *Chlorella vulgaris*.

The presented achievements undoubtedly enrich the photosynthetic research, as they improve our knowledge of the species-specific response of the photosynthetic organisms to various environmental factors. However, I believe that Dr. Rashkov could have put a stronger accent on the originality and innovation of the defined contributions, and how they could help to solve the global problems identified in the introduction to the habilitation report, for example, “increasing the resilience of plants and ensuring food security in the background of changing climate conditions”.

The presented future research plans of Dr. Rashkov are closely related to the topic of the “Photoexcitable Membranes” department at the IBPhBME-BAS and I believe that they would be useful for the future scientific development of the department and the enrolment of new young and established scientists to the research team.

Conclusion:

Based on the submitted documentation for the competition, as well as my personal impressions of Dr. Georgi Rashkov's work at IBPhBME-BAS, I believe that he has the necessary qualifications and expertise in the field of biophysics of photosynthetic processes, required for the academic position “Associate Professor” in the area of higher education 4. “Natural Sciences, Mathematics and Informatics”, professional field 4.3. “Biological Sciences” (Biophysics). I believe that his future scientific work will greatly contribute to the high quality research in the main scientific areas of the department of “Photoexcitable Membranes”.

I confidently express a positive assessment and support the election of Sen. Assist. Prof. Georgi Rashkov for the academic position of “Associate Professor” at the “Photoexcitable Membranes” department of IBPhBME-BAS.

Data: 14.11.2024

Signature: 

/Prof. Dr. Sashka Krumova/