

OPINION

by **Prof. Anelia G. Dobrikova, PhD**
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Regarding the competition for the academic position "Associate Professor",
announced in the State Gazette No. 69/16.08.2024
Professional field: 4.3. Biological sciences
Scientific specialty: Biophysics

Member of the Scientific Jury according to Order No. 1352/14.10.2024
of the Director of IBPhBME - BAS

For participation in the announced competition for the academic position "Associate Professor" for the needs of the department "Photoexcitable Membranes" at the IBPhBME-BAS, only one candidate from the same department has submitted documents: **Senior Assist. Prof. Georgi Dimitrov Rashkov, PhD**. The documents for participation in the competition, submitted by the candidate, are presented in full following all the requirements of the Act for the Development of the Academic Staff in the Republic of Bulgaria (ADASRB) and the Regulations for its application at IBPhBME - BAS.

Brief biographical data for the applicant:

Georgi Rashkov received his master's degree in "Nuclear technique and nuclear energy" from the Faculty of Physics at the Sofia University "St. Kliment Ohridski" in 2002. In 2006, he started to work at the Institute of Biophysics - BAS, now the Institute of Biophysics and Biomedical Engineering (IBPhBME) as a specialist physicist, and between 2014 and 2019 he was a PhD student in the department "Photoexcitable Membranes". In May 2019, Georgi Rashkov defended his doctoral dissertation on the topic: "Possibilities for the application of photosynthetic membranes as a bioreceptor for registration of pesticides" to receive the educational and scientific degree "Doctor" (PhD) in the scientific specialty "Biophysics" at the IBPhBME - BAS. Since October 2021, he has been appointed as Senior Assist. Prof. in the same department.

Research activities of the applicant:

Senior Assist. Prof. Dr. Georgi Rashkov has a total of 21 scientific publications referenced in Scopus/Web of Science. According to Scopus (November 2024), they have been cited (without self-citations) over 230 times with an *h*-index: 8. In the current competition, he participates with a total of 16 scientific publications - 2 with SJR (Q4) and 14 in reputed journals with impact factor (ISI IF), 11 of which are with quartile Q1, 2 with Q2, 1 with Q3 (according to www.scimagojr.com). The overall IF of the scientific publications for the competition is 52,4. I would note that 6 of the publications are from the last 2 years (2023-2024) and in 2 of them Dr. G. Rashkov is the first author. A reference list with 42 selected citations in Scopus was also presented for the competition. All this suggests the high quality and relevance of the scientific publications. These scientific indicators fully meet and exceed the requirements for the academic position "Associate Professor" according to the Regulations for the application of ADASRB at IBPhBME-BAS, covering the minimum requirements for all groups of indicators, as follows: A - 50, C - 100, D - 254, E - 84.

All publications presented for the current competition reflect significant scientific research mainly in the field of biophysical characterization of the functional efficiency of the photosynthetic apparatus under physiological and stress conditions.

According to the submitted documents, Dr. Georgi Rashkov has participated in a total of 5 scientific projects sponsored by the Bulgarian National Science Fund (2 of which are international with India and Slovakia) and 3 Bilateral Agreements with Egypt, Hungary and Greece. A report of a total of 33 participations in 22 scientific forums is also presented.

Scientific topics and contributions of the publications:

The scientific results and original contributions from the publications of Senior Assist. Prof. Dr. Georgi Rashkov, described in the extended habilitation report, are mainly related to the detailed and in-depth study of the mechanisms by which the photosynthetic apparatus of various plant species adapts to the abiotic stress factors of the environment, such as drought, salinity, high temperature, UV radiation, etc. The study of protective and adaptation mechanisms, as well as the application of different signaling molecules to improve the photosynthetic efficiency of plants under abiotic stress factors, can be used to develop successful strategies for obtaining more resistant crops and their varieties. In recent years, there has been a growing interest in studying photosynthetic tolerance as a tool to improve crop yields under adverse environmental conditions to address the consequences of climate change.

Different plant species (including pea (C3), maize and sorghum (C4), and the tree species *Paulownia*), as well as their hybrid genotypes, algae and cyanobacteria, have been investigated. The functional activity of the photosynthetic apparatus under physiological and stress conditions was evaluated by modern and relevant methods such as: PAM chlorophyll fluorescence for the analysis of the function of photosystem II (PSII), JIP test for the analysis of the fast phase of fluorescence induction kinetics, P700 photooxidation for analysis of the PSI activity and the rate polarographic oxygen electrode to assess the oxygen-evolving complex. The parameters determined by these methods are very sensitive to various abiotic factors and can be useful in studying plant tolerance.

The scientific topics are divided into two main areas:

1. Investigation of the impact of abiotic stress factors on the photosynthetic apparatus and its adaptation mechanisms in different plant species, cyanobacteria, and green algae. Application of chlorophyll fluorescence methods (PAM and JIP test) to analyze the photosynthetic apparatus.
2. Role of exogenously applied signaling molecules and nanoparticles on different plant species under physiological conditions and abiotic stress.

The main scientific contributions of the publications to the first research area are related to: 1) Establishing the different resistance and protective mechanisms of the photosynthetic apparatus to salt stress in the different plant species – pea, maize, sorghum, *Paulownia* and their hybrid lines; 2) Showing the influence of different drought levels on the photosynthetic performance of maize and sorghum, and establishing better drought tolerance of maize compared to sorghum. New information has been provided about the role of regulated energy losses and "state transition" in the protection of the photosynthetic apparatus under drought, which could be a practical approach to determine the plant tolerance to this stress; 3) Investigating the sensitivity of the photosynthetic apparatus of the cyanobacterium *Synechocystis salina* and the green microalga *Chlorella vulgaris* to UV-B radiation and revealing changes in the energy transfer between chlorophyll-protein complexes, primary photochemistry of PSII and photosynthetic oxygen evolution, more pronounced in cyanobacteria than in green microalgae; 4) Investigating the effect of high temperature on the functional activity of PSII in pea thylakoid membranes and

establishing the stronger inhibition of PSII α than PSII β centers; 5) Evaluating the effect of sanosyl-induced oxidative stress on the donor and acceptor side of PSII in *Chlorella vulgaris* and *Synechocystis salina* isolated from Antarctic and mesophilic environments.

The scientific contributions of the publications to the second research area are mainly related to assessing the role of exogenously applied signaling molecules (nitric oxide and 24-epibrassinolide), microalgae and zinc nanoparticles to improve the photosynthetic efficiency of different crop species and their genotypes under physiological conditions, as well as to reduce the negative impact of environmental stress factors. The resistance and protection mechanisms of the photosynthetic apparatus in the various studied plants have also been shown.

The personal contribution of Dr. Georgi Rashkov in the publications submitted for this competition is related to the evaluation of the functional activity of the photosynthetic apparatus under physiological conditions and after exposure to environmental stress factors through measurements and analysis of the signals obtained by the chlorophyll fluorescence methods (PAM and JIP test) and the rate oxygen electrode.

The future research plans of Dr. Georgi Rashkov relate to more in-depth studies of the regulatory mechanisms of photosynthesis in pea plants and their mutant lines under abiotic stress, using chlorophyll fluorescence methods and oxygen evolution. The application of various new nano-biocomposites to improve the functions of the photosynthetic apparatus under physiological and stress conditions is also envisaged.

Conclusion

The materials presented for the competition and the scientific indicators of Senior Assist. Prof. Georgi Rashkov, PhD, meet all the requirements and fully cover the minimum required points for all groups of indicators of the Regulations for the application of ADASRB at IBPhBME-BAS. I believe that G. Rashkov has an undeniable competence in the main scientific topics developed in the department "Photoexcitable Membranes", which would be very useful for the future scientific development of the department. Therefore, he is a very suitable candidate for the academic position "Associate Professor" in this department.

All mentioned above allows me to give my positive assessment and strongly recommend to the Scientific Jury to prepare a proposal to the Scientific Council of IBPhBME-BAS for the election of Senior Assist. Prof. Georgi D. Rashkov, PhD, for the academic position "Associate Professor" in the professional field: 4.3. Biological sciences and scientific specialty: Biophysics.

Date: 20.11.2024


Prof. Anelja Dobrikova, PhD