

BRIEF REFEREE REPORT

Regarding the competition for the academic position of "Associate Professor" in the field of higher education 4. Natural Sciences, Mathematics, and Informatics, professional field 4.3. Biological Sciences (scientific specialty: Biochemistry),

announced in the State Gazette, Issue 62/23.07.2024, for the needs of the "Photosynthesis - Activity and Regulation" laboratory at the Institute of Plant Physiology and Genetics (IPPG), Bulgarian Academy of Sciences (BAS)

Referee: Prof. Galina Teneva Yahubyan, PhD

Scientific specialty: Molecular biology

Institution: University of Plovdiv "Paisii Hilendarski"

Appointed as a member of the scientific jury by Order RD 01-43/20.09.2024, IPPG, BAS**

One candidate - Chief Assistant Professor Gergana Kirilova Mihailova, PhD, takes part in the announced competition for the academic position of "Associate Professor" in the specialty "Biochemistry" at IPPG, BAS.

The submitted documents are in accordance with the requirements of the Law on the Academic Staff Development in Republic of Bulgaria, the Regulations for its implementation and the Regulations of for the specific conditions and procedure for acquiring scientific degrees and holding academic positions in IPPG, BAS.

1. Candidate's career profile

Ch. Asst. Prof. Dr. Assistant Dr. G. Mihailova holds a BSc degree in Molecular Biology (2004, Sofia University "St. Kliment Ohridski"), a MSc degree in Biochemistry (2006, Sofia University "St. Kliment Ohridski"), and a Ph.D. in Biochemistry (2012, IPPG, BAS). Dr. G. Mihailova began her career in 2009 as a Research Fellow III/Assistant at the IPPG, BAS, in the "Photosynthesis - Activity and Regulation" laboratory, and since 2014 has held the position of Chief Assistant. She has undertaken several doctoral and postdoctoral specializations and work visits in leading research centers and laboratories abroad. She is a member of the Union of Scientists in Bulgaria, section "Plant Physiology and Biochemistry," and the Federation of European Societies of Plant Biology (FESPB).

2. Evaluation of the submitted report for compliance with the requirements of Article 26, paragraph 1 of the Law on the Development of Academic Staff in the Republic of Bulgaria (ZRASRB) and the specific requirements for holding the academic position of 'Associate Professor,' as outlined in Appendix 1 of the Rules for the Specific Conditions and Procedure for Obtaining Academic Degrees and for Holding Academic Positions at the Institute of Plant Physiology and Genetics.

Ch. Asst. Prof. Dr. G. Mihailova participates in the competition with:

- **1 dissertation** for the acquisition of ONS "Doctor" (50 points);
- 20 scientific works in refereed and indexed international journals with a total JCR IF of 43.952, including:
 - 19 research articles and 1 review article;
 - 4 articles qualifying as habilitation work, assigned to category B with 100 points;

- 16 scientific publications in category G, with 280 points, including 140 points from 7 papers where the candidate is the first or corresponding author;
- distribution by quartiles includes 12 Q1 articles, 2 Q2 articles, 1 Q3 (JCR IF), and 1 Q3 (SJR);
- 9 projects, 6 national and 3 international ones (120 points);
- 196 citations of 32 scientific publications (as per Web of Science and Scopus databases), forming a total of 392 points;
- h-index of 9 (Scopus).

The candidate's total score of 942 points significantly exceeds both the national minimum criteria and the enhanced requirements of IPPG, BAS, for the position of "Associate Professor."

3. Analysis of the main areas of the candidate's research work and the most important results in each area, highlighting his/her personal contributions.

Dr. G. Mihailova's research focuses on plant tolerance mechanisms to abiotic stress, using *Haberlea rhodopensis*, a unique "resurrection" plant that can survive prolonged desiccation and recover fully upon rehydration, as a model organism. She investigates physiological and biochemical changes under drought conditions with high light intensity or low temperatures, aiming to understand how these mechanisms can be applied to improve crop resilience. Her research provides original contributions to understanding the molecular mechanisms governing essential processes in plants under stress.

Dr. G. Mihailova reports in numerous scientific papers the results of the first comprehensive study on the effect of light intensity on the desiccation process in *H. rhodopensis*. For this purpose, comparative analyses were conducted on two populations of the species - "shade" and "sun," found in natural habitats with low and high light intensity levels, respectively (B4-01, G7-01, G7-02, G7-03, G7-06). To link protective stress mechanisms with precise environmental parameters, the researcher conducted analyses of both populations under controlled conditions in a climate chamber (B4-02, B4-03, B4-04, G7-04, G7-05, G7-07, G7-08, G7-09, G7-10, G7-14). The studies include quantitative assessments of various physiological and biochemical indicators, as well as gene expression linked to plant responses to abiotic stress. Dr. Mihailova presents a range of evidence concerning the protective mechanisms of *H. rhodopensis* in response to desiccation, including morphological and structural changes (B4-02, B4-03, G7-08), reduced photosynthetic activity (B4-03, G7-03, G7-04, G7-09), increased thermal energy dissipation (B4-02, B4-03, G7-04), accumulation of sugars and antioxidants (B4-04, G7-05, G7-08, G7-14), activation of stress-induced proteins (G7-09, G7-14), and how these factors may be modulated by light intensity. Based on these observations, the author concludes that, under controlled conditions, the "sun" population, despite the added stress of high light exposure, can recover after rehydration faster than the "shade" population.

Another important area in Dr. Mihailova's scientific research is the study of the protective mechanisms of *H. rhodopensis* in acclimatization to low positive and negative temperatures. These studies were also conducted in natural conditions and under controllable conditions in a climate chamber. Acclimatization to low positive temperatures is associated with maintaining high photosynthetic activity, increased hexose content, and changes in the amount of photosynthetic proteins (G7-11, G7-13). Acclimatization to low negative temperatures induces desiccation and leads to significant changes in the form and structure of chloroplasts, inhibition of photosynthetic activity, increased content of sugars like sucrose

and raffinose, and accumulation of stress-induced proteins (G7-11, G7-13, G7-15). A similarity is observed in the mechanisms *H. rhodopensis* employs to survive adverse environmental factors such as desiccation and low temperatures (G7-11, G7-13, G7-15). The plant response to low negative temperatures was also investigated in two other closely related resurrection plant species, *Ramonda serbica* and *Ramonda nathaliae*, in which negative temperatures induce desiccation and share the specifics of the stress response with *H. rhodopensis* (G7-13, G7-15).

Dr. Mihailova's publications are collaborative works, with her contribution to each scientific study precisely documented in the submitted materials, demonstrating her substantial involvement in planning, conducting, funding, and presenting the research.

4. A reasoned response regarding the extent to which the candidate has a clearly defined and current scientific theme, indicating its significance for science and society

Based on the submitted application materials, it is evident that Dr. G. Mihaylova has developed as a researcher with in-depth knowledge and methodological skills in various fields of plant biochemistry and physiology, as well as a creative and reliable partner in collaborative research projects. The candidate's scientific output includes significant contributions recognized by the international scientific community, evidenced by publications in prestigious international journals where Chief Assistant Dr. G. Mihaylova's work appears and is cited, such as *Environmental and Experimental Botany* (IF 5.5), *International Journal of Molecular Sciences* (IF 5.6), *Plants* (IF 4), among others.

5. Organizational and training activities

Dr. G. Mihailova participated as a mentor in the Ministry of Education and Science's "Student Internships" project, funded by the European Social Fund in 2017, supervising two students from the Faculty of Biology at Sofia University "St. Kliment Ohridski". She also co-supervised a pre-graduation internship and thesis of a student from New Bulgarian University (2019-2020).

6. Critical remarks and recommendations

The scientific works and activities presented by Dr. G. Mihaylova meet the requirements of the scientific specialty for the competition, both in scope and quality, and I have no critical remarks regarding them

7. Reasoned positive or negative conclusion regarding the selection

The candidate Dr. Gergana Kirilova Mihailova meets the mandatory and specific conditions and scientific-metric criteria for the academic position of "Associate Professor" according to the requirements of the Law on the Academic Staff Development in Republic of Bulgaria, the Regulations for its implementation and the Regulations of IPPG, BAS. I confidently give my **positive assessment** of the academic performance of Ch. Assit. Prof. Dr. G. Mihailova in this competition. I recommend to the Scientific Jury to prepare a report-proposal to the Scientific Council of IPPG, BAS, **for election of Ch. Asst. Prof. Dr. G. Mihailova of the academic position "Associate Professor"** at IPPG, BAS, in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.3. Biological sciences (scientific specialty Biochemistry).

October 30, 2024

/Prof. Galina Yahubyan, PhD /