OPINION

by Prof. PhD Elena Ivanova Georgieva

on conducting a competition for the academic position "Associated Professor", announced for the needs of the laboratory "Photosynthesis - activity and regulation" at the Institute of Plant Physiology and Genetics (IPPG) - BAS; appointed as a member of the scientific jury by order of the Director of IPPG № RD 01-43/20.09.2024.

1. General part

The competition for "Associated Professor" in the specialty "Biochemistry", field of higher education 4. Natural Sciences, Mathematics and Informatics; professional field 4.3. 62/23.07.2024 for the needs of the Institute of Plant Physiology and Genetics at the Laboratory "Photosynthesis - Activity and Regulation" of the same Institute.

Documents for the announced competition were submitted by only one candidate – Assistant Professor Ph.D. Gergana Kirilova Mihaylova, with a research profile in biochemistry, but carrying out research activities in molecular genetics, stress and genomic dynamics in plants in the above laboratory. The procedure for opening and announcing the competition has been followed. The submitted documents fully comply with the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria, its supplements and the Regulations on the Specific Conditions and Procedure for the Acquisition of Scientific Degrees and for the Occupation of Academic Positions at the IPPG-BAS, meet the requirements for the academic position of Associate Professor and certify that the procedure can be initiated.

2. General data on the applicant's career and thematic development

Ph.D. Gergana Mihailova completed her higher education at Sofia University “St. Kliment Ohridski”, Faculty of Biology with qualifications: in 2004 Bachelor of Molecular Biology and in 2006 Master of Biochemistry. Immediately after graduating from her master's degree, she enrolled in the Institute of Plant Physiology - BAS, now the Institute of Plant and Genetics Physiology - BAS. Six years later, 2012, Mihailova defended her dissertation on the topic: "Drying of the resurrection plant *Haberlea rhodopensis* in high temperature conditions and various light regimes" and acquires the Scientific Educational Degree "Doctor" in the scientific specialty "Biochemistry", with Awarded a diploma from BAS. Since 2014 so far, she has been appointed and worked as a Assistant Professor at the same institute. The candidate's scientific production is extremely rich, fully corresponds to the profile of the announced competition and can be summarized as follows: total number of scientific publications: 42 experimental and 1 review reflected in a chapter of a book with a common impact factor (IF) 96.097, and in 16 Publications she is the first or corresponding author. The candidate's scientific production is as follows: Q1 - 22; Q2 - 8; Q3 - 2; Q4-1, and the **h-Index** of her scientific production according **to Scopus is 8**. In this competition, Ph.D. Mihailova participates with 19 original scientific works and 1 review article reflected in a chapter of a book. IF of all publications for her participation in the competition is 43.952, and is the first and/or corresponding author in 7 of them with IF 19.044. Of these 19 scientific works - related competitions, 14 are published in IF referencing magazines, 3 are without IF, but indexed in WOS and/or

Scopus (No 3, 4, 10); 1 publication is without IF, but with SJR (No. 7) and one (No. 8) is published in non -indexed WOS and Scopus. The apartments are as follows: Q1 - 12; Q2 - 2 and Q3 - 1. The citation report submitted according to Scopus and WOS, shows a large total number of cited - 196 of Ph.D. Mihailova's scientific production in international, foreign and referred magazines, which is an important criterion for high scientific capacity and significance of results achieved. The number of participations of the candidate in scientific forums is impressive. From the well-presented list it is evident that with posters and reports, Ph.D. Mihailova has participated in 32 international, national and national with international participation scientific forums, of which 20 international. The data presented by the candidate for participation in scientific projects are also impressive. For the period since 2007, Ph.D. Mihailova has participated as a contractor in 23 scientific projects funded by the international organization of the IAEA, from the FNI to the Ministry of Education and Science on fundamental scientific competitions and bilateral international cooperation with Germany, Hungary, Italy, Latvia. In the main part, the topics of the won projects are according to the requirements of the competition for the academic position "Associated Professor".

For a period of 16 years, Ph.D. Mihailova has conducted a relatively large number of specializations related to scientific activities in joint research projects at prestigious scientific institutes in Hungary, Germany, Italy and Spain, who have contributed to her professional development and career growth as an undeniable scientist in the area of plant biochemistry. The evaluation of high competence and excellent results is her third scientific award for poster message at an international conference held in 2008, in the town of Elena, Bulgaria.

The report generated by SONIX, a system for reporting scientific and expert activities at BAS, shows that Dr. Mihailova has made 46 reviews of articles for prestigious scientific journals such as *Plants, Toxics, Antioxidants, Molecules, International Journal of Molecular Sciences, Physiologia Plantarum*, etc., which is evidence of an internationally recognized scientist.

Gergana Mihaylova is a member of the Union of Scientists in Bulgaria, Section "Plant Physiology and Biochemistry" and of the Federation of European Societies of Plant Biology (FESPB).3. Assessment of the submitted report of compliance with the requirements of the ZRASRB and the specific requirements of IPPG-BAS for occupation of the academic position "Associated Professor".

The report on the implementation of the MNI of the ZRASRB for the Scientific Area 4. Natural Sciences, Mathematics and Informatics Professionals: 4.3 Biological Sciences, in accordance with the additional regulations adopted to the law in IPPG-BAS, certifies that Assis. Prof PhD Gergana Mihailova, forms 943 points, of the mandatory minimum 540 tons. These values not only cover, but also almost twice exceed the academic position "Associated Professor". By different indicators the figures are as follows:

Indicator group	**Content**	**Minimum requirements**	**Points**
A	Indicator 1	50	50
B	Indicator 2	-	-
C	Indicators 3 and 4	100	100

D	Sum of indicators 5 to 10	220	280
E	Sum of points in indicator 11	100	392
F	Sum of indicators 12 to end	70	120

Scientific indicators indicate that PhD Mihailova is a scientist with high professional qualification in the field of plant biochemistry, molecular biology and genetics.

4. Analysis and evaluation of scientific achievements in the applicant's research work

For more than 20 years, plant species withstand months to years of drought and recover completely in the presence of water have been the subject of intensive studies. There are also published data reflecting genomic and biochemical Molecular mechanisms of dry resistance in *Haberlea rhodopensis*. New genes have been established involved in the mechanisms contributing to drought tolerance, as well as ongoing biochemical changes.

Ph.D. Mihailova's research and research is dedicated to the study of the physiological and biochemical response of the photosynthetic apparatus of the coated plant *Haberlea rhodopensis*, family *Gesneriaceae*, to drought and to the action of other stress factors, as high light intensity. This plant belongs to a small group (about 350 species) of higher plants called "resurrected" because of their exceptional ability to experience the loss of more than 90% of their water content and quickly recover in rehydration. *Haberlea rhodopensis* has a high eco -plasticity and is a suitable model system for the study of the mechanisms of tolerance to abiotic stress. The reports presented for the competition are related to the study of the mechanisms of tolerance of the resurrecting plant *Haberlea rhodopensis* to drought in conditions of high light intensity or under the action of low temperatures.

In the scientific contribution reference, Ph.D. Mihailova defines 2 fields of scientific research:

1. Drought the resurrective plant Haberlea rhodopensis under conditions of high light intensity.

2. Cold resistance to the resurrected plant Haberlea rhodopensis. Photosynthetic activity and biochemical mechanisms of adaptation of the plant to low positive and negative temperatures. Comparing the response to the resurrecting plants of the genus Haberlea and the genus Ramonda, family Gesneriaceae, to low temperatures.

The first scientific direction has been explored thoroughly and is supported by many important results published in prestigious high -rated scientific journals. Photosynthetic and biochemical characteristics of *Haberlea rhodopensis* plants are studied, growing in various light modes in their natural habitats. *Haberlea rhodopensis* grows mainly on shady habitats at very low light intensity and high air humidity, but is also found in places exposed to direct sunlight. The effect of light intensity in the process of drought *Haberlea rhodopensis* has been evaluated for the first time, by comparing changes in photosynthetic activity and in the amount of some stress markers measured in plants growing under different light regime in natural

conditions. The results are reflected in publications No. B4-01, G7-01, G7-02, G7-03, G7-06.

There are also data to this direction, some of which are pioneered, from comparing the protective mechanisms during the drought of solar and shady plants *Haberlea rhodopensis*, from a habitat-publications No. B4-02, B4-03, B4-04, G7- 04, G7-05, G7-07, G7-08, G7-09, G7-10, G7-14. For the first time she have been examined in parallel and compared to sunny and shady plants *Haberlea rhodopensis*. The plants have been shown to be phenotypically different, and that drought inhibits photosynthesis to a greater extent in solar plants. *Haberlea rhodopensis* solar and shady plants have been shown to have a very high antioxidant and anti -radical activity. With the help of a mathematical model, the kinetics of electrolyte leakage in the resurrecting plants were first established. It has been found that shady plants are characterized by a lower value and slower as a rate of leakage of electrolytes than the solar. It has been shown that the "exclusion" of photosynthesis is a protective mechanism in homeochlorophilic resurrecting plants in the process of drought, which helps to reduce the formation of ROS in the electron-transport circuits. Sunny plants *H. rhodopensis* are subjected to additional stress during drought in a strong light intensity, but still recover faster after rehydration than shady.

In the next scientific direction, an assessment of photosynthetic activity and the biochemical mechanisms of the plant adaptation to low positive and negative temperatures is made. The answer to the resurrected plants of the *Haberlea* genus and the *Ramonda* genus, the family *Gesneriaceae*, to low temperatures, is compared. The cold resistance of the resurrected plants is very poorly studied. In this area, the candidate received and published important results, reflected in publications G7-11, G7-12, G7-13, G7-15. In the process of acclimatization of *Haberlea Rhodopensis*, Ph.D. Mihailova examined the protective mechanisms to low positive and low negative temperatures. The contribution of these studies is significant and shows that the expression of stress-induced proteins plays an important role in the acquisition of resistance to low negative temperatures in both *H. Rhodopensis* and *Ramonda serbica* and *Ramonda nathaliae*.

A review article, published as a chapter of a book (G8-01), summarizes information on the tolerance of the photosynthetic apparatus of homeochlorophilic and pokilochlorifelous resurrection plants to drought. The effect of light and high temperature on photosynthesis is considered.

5. The relevance of scientific subjects and its importance to science and society

Ph.D. Mihailova's research and interests throughout the work experience are focused on fundamental and scientific and applied research in plant functional biochemistry and molecular genetics-a very difficult area for experimental work aimed at strategically important areas for our country and definitely deserves high evaluation. Drying is the most common abiotic stress and causes significant damage to the agricultural harvest in Bulgaria. In their totality, the contributions made to this scientific study provide valuable information about biochemical and molecular mechanisms to create an approach to identify specific genes and biochemical pathways contribute to the resistance to drought and cold resistance to the resurrecting plant *Haberlea rhodopensis*. The study of biochemical and molecular

mechanisms for dry resistance and cold resistance in the resurrection plants and their primary and secondary metabolites accumulating during stress is important for the identification of potential strategies for improving the resistance to drought and cold resistance in agriculture. And for better environmental plasticity and adaptation to climate change. Improving the productivity and resistance of cultural plants in stress conditions is paramount to agriculture and eating the increasing population. The accumulated results would also find potential applications in biotechnology, medicine and cosmetics.

6. Organizational and Training Activity

Ph.D. Mihailova is a participant and contractor in national and international research projects, the leader of a graduating year of a project for bilateral cooperation. He is the leader of one graduate (bachelor) at Sofia University, a specialist with a pre-graduate experience at NBU and 2 students under the Student Practices Program at Sofia University.

7. Critical notes and recommendations

I have no critical notes and recommendations. I was a great impression on Ph.D. Mihailova's critical attitude about her personal contribution to the published results, as well as her views on future research, which in my discretion is promising and significant.

8. Conclusion

The only candidate appeared to participate in the competition for Associated Professor announced by IPPG-BAS for the needs of the Laboratory "Photosynthesis-Activity and Regulation" is Ph.D. Gergana Mihailova. The applicant's scientific and applied activity is supported by a large number of quotes, significant publications reflected in prestigious high IF magazines, participation and management of national and international projects, educational activities. The science metric data presented are extremely high and exceed the competition requirements. They contribute not only to the international recognition and raising the scientific prestige of the candidate, but also of the institute in which she works. Ph.D. Mihailova's overall scientific activity is up-to-date, professionally represented and is in line with our national and European priorities. The published scientific and scientific and applied results are an original contribution to science and meet all the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria (ZRASRB), the rules for its application and the internal rules of IPPG-BAS for occupation of the academic position "Associated Professor" in the field of higher education 4. Natural sciences, mathematics and computer science; Professional direction 4.3. Biological sciences; Scientific specialty "Biochemistry". What has been said here gives me a reason to recommend to the respected scientific jury and the IPPG-BAS Scientific Council to award to Assis. Prof. Ph.D. Gergana Kirilova Mihailova, the academic position "Associated Professor".

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/Prof. Ph.D. Elena Georgieva/