

## **REVIEW STATEMENT**

### **ON THE COMPETITION FOR THE ACADEMIC POSITION "PROFESSOR"**

**FIELD OF HIGHER EDUCATION:** 4. Natural Sciences, Mathematics and Informatics

**PROFESSIONAL FIELD:** 4.3 Biological Sciences

**SCIENTIFIC SPECIALTY:** Plant Physiology

**CANDIDATE:** Associate Professor Dr. Iskren Georgiev Sergiev

**STATEMENT PREPARED BY:** Professor Dr. Valya Nikolova Vassileva

#### **1. GENERAL INFORMATION ABOUT THE PROCEDURE**

In the competition for the academic position "PROFESSOR", announced in the State Gazette, no. 12/09.02.2024, for the needs of the "Regulators of plant growth and development" laboratory at the Institute of Plant Physiology and Genetics (IPPG) of the Bulgarian Academy of Sciences (BAS), the sole candidate is Dr. Iskren Georgiev Sergiev, an Associate Professor in the same laboratory. The submitted documents comply with the requirements of the Law on Academic Staff Development in the Republic of Bulgaria (LASDRB), the Regulations for the Implementation of LASDRB, and the Regulations on the Specific Conditions and Procedures for Acquiring Scientific Degrees and Occupying Academic Positions at IPPG-BAS. The scientific works of Assoc. Prof. Sergiev are substantial in volume and quality with a thematic focus that is highly relevant for the competition for the academic position "PROFESSOR" in the scientific specialty "Plant Physiology".

#### **2. INFORMATION ON THE PROFESSIONAL DEVELOPMENT OF THE CANDIDATE**

Dr. Iskren Sergiev graduated from the Faculty of Biology at Sofia University "St. Kliment Ohridski" majoring in "Biochemistry and Microbiology", specialising in "Plant Physiology". During the period 1995–1998, he developed a doctoral dissertation on the topic "Cytokinin antagonists - structure-activity relationship and some physiological properties" as a full-time doctoral student at the Institute of Plant Physiology "Acad. M. Popov"-BAS (currently IFRG-BAS). In 2000, he obtained the educational and scientific degree "Doctor" in the specialty "Plant Physiology", after which he successively moved from the position of Research Associate I (2000 - 2006) to habilitation as Senior Research Associate II (2006–2010), subsequently transformed into an Associate Professor (from 2010) at IFRG-BAS. According to the presented certificate from IFRG, Dr. Sergiev is currently on an indefinite-term contract of employment as an Associate Professor in the "Regulators of Plant Growth and Development" laboratory with a total work experience of over 32 years.

The research interests of Assoc. Prof. Sergiev focus primarily on the field of plant physiology and biochemistry with a particular emphasis on the role of phytohormones and synthetic growth regulators in the physiological response of plants to stress factors. He has extensive experience in conducting biochemical, HPLC, GC-MS and LC-MS/MS analyses, acquired in prestigious scientific organisations in Italy and Belgium through joint projects with various partners, including Syngenta USA. Throughout his research career, Dr. Sergiev has published 89 articles, including 80 research papers, and 9 book chapters and review articles. About 35% of the papers (31 in total) have been published in Q1 and Q2 journals, indicating the high quality and significance of his research. The total impact factor of his publications is 75.666. Many of the published papers are based on project developments covering research topics in plant physiology and biochemistry, such as the investigation of new growth regulators, the role of

phytohormones and polyamines in plant stress tolerance, and the defense mechanisms of plants against abiotic and biotic stress factors. His active participation in research projects and initiatives at the national and international levels is demonstrated by an impressive list of 37 projects in which he has been involved as a project leader or participant. This underscores not only his commitment and professionalism but also his ability to work effectively in collaboration with colleagues from our country and abroad. His publications have been cited 2774 times, reflecting the positive reception of his research by the global scientific community. The Hirsch-index (H-Index) of Dr. Sergiev in the Scopus database is 13.

The Candidate has considerable experience in organising national and international scientific forums, such as the 5<sup>th</sup> International Youth Symposium "Plant Metabolism Regulation", the 11<sup>th</sup> Congress of the Federation of European Societies of Plant Physiology (FESPP), the International Scientific Conference "Responses of Plants to Environmental Stresses" among others. A list of his presentations at national and international scientific forums is also provided, including 28 abstracts from participation in 16 conferences, highlighting his active contribution to the dissemination and promotion of the obtained results within the scientific community.

Prof. Sergiev 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).

### **3. TRAINING ACTIVITY OF THE CANDIDATE**

As the mentor of the doctoral course "Natural and synthetic growth regulators" at the BAS Training Center, Prof. Sergiev has successfully trained 5 doctoral students. In addition to this teaching activities, he has served as a scientific consultant to a doctoral student who successfully defended her dissertation through independent training. No information is provided about other graduates who have defended their theses.

### **4. COMPLIANCE WITH THE REQUIREMENTS FOR THE ACADEMIC POSITION "PROFESSOR"**

For participation in the announced competition, Dr. Sergiev presents comprehensive and excellently structured information about his research activities, which not only fully meet but in most categories exceed the minimum national requirements. He enters the competition with 21 research papers that were not used for obtaining the educational and scientific degree "Doctor" or the academic position "Associate Professor".

The number of publications in scientific journals is 18, distributed by quartiles (Q) as follows: Q1 - 7 publications, Q2 - 5 publications, Q3 - 3 publications and Q4 - 3 publications. Assoc. Prof. Sergiev is the first author in 5 publications and the corresponding author in another 5. The total JCR impact factor (JCR IF) of all articles included in the competition is 26.381, and the JCR IF of the publications where Associate Professor Sergiev is the first or corresponding author is 15.694. The list of works for the competition also includes 3 book chapters. All featured publications are co-authored.

The indicators from Group A are covered by a defended dissertation for the award of the educational and scientific degree "Doctor" (50 points). The points for the indicators in Group B are met by 3 papers published in Q1 journals, 1 publication in a Q2 journal and 1 publication in a Q4 journal, totaling 107 points out of the required 100 points. Regarding the indicators from Group C, 13 publications that are referenced and indexed in world-renowned scientific databases (Web of Science and Scopus) have been presented. Of these, 4 papers are published in Q1 journals (4 x 25 = 100 points), 4 papers in Q2 journals (4 x 20 = 80 points), 3 papers in Q3 journals (2 x 15 = 30 points + 1 x 10 points = 40 points) and 2 papers in Q4 journals (1 x 12 = 12 points + 1 x 10 points = 22 points).

There are 3 book chapters without quartile rankings (3 x 15 = 45 points). Thus, the total number of points for the indicators in Group C is 287 points out of the required 220 points. The candidate greatly exceeds the requirements set out in Indicator D (specifically D-11), which reflects citations in scientific papers, referenced and indexed in world-renowned databases. Over the last 7 years, 1310 independent citations have been noted (1310 x 2 points = 2620 points out of the required 200 points). The total number of points for Indicators 12 to 20 in Group E is 160 points out of the required 150 points. The candidate receives 80 points (8 x 10 points = 80 points) for Indicator E-14 (Participation in national scientific or educational projects), 20 points for Indicator E-15 (Participation in international scientific or educational projects), 20 points for Indicator E-16 (Leadership of national scientific or educational projects) and 40 points for Indicator E-18 (Secured funding for projects led by the candidate). He has advised a doctoral student who successfully defended her dissertation through independent study, but due to legal regulations, he has not been awarded points for this activity.

## **5. EVALUATION OF THE SCIENTIFIC ACHIEVEMENTS**

Dr. Sergiev has comprehensively summarised his main scientific achievements into four thematic areas over 8 pages. I fully accept this summary as the basis for evaluating his academic contributions and achievements. The report presents the overall achievements of the published works and the individual contributions of Dr. Sergiev to the research conducted.

**Research topic 1.** *Physiological action of herbicides on plant metabolism and photosynthesis under various growing conditions and treatment with growth regulators and natural metabolites* (Publications No. 1, 4, 6, 7, 11, 20, 21)

The main achievements in this research topic include studying the physiological effects of herbicides under optimal and suboptimal conditions, and discovering environmentally friendly substances for plant protection. The Candidate found that hydrogen peroxide protects pea plants from oxidative stress caused by the herbicide paraquat, and that cytokinin 4PU-30 reduces damage from the herbicide glyphosate in young maize plants. Prolonged exposure to low concentrations of atrazine causes growth retardation, cell membrane damage and disruptions in redox homeostasis in pea plants. Noteworthy are the studies on the effects of the selective herbicide Serrate® on the response of the photosynthetic apparatus of wheat and triticale to drought and waterlogging, which show that wheat has better drought tolerance and recovery after drought, while triticale recovers better after waterlogging. The personal contributions of the Candidate include coordinating the research, participating in experiments and analyses, processing the results and drafting the articles. In two of these papers, he is the corresponding author.

**Research topic 2.** *Modulating action of synthetic auxins in shaping the physiological response of plants to abiotic stress* (Publications No. 13, 14, 16, 17, 19)

Prominent are the studies on the physiological action of new structural analogues of phytohormones in combination with herbicides and under stress factors such as drought and high temperature in monocotyledonous and dicotyledonous plants. It has been found that pretreatment with 1-[2-chloroethoxycarbonyl-methyl]-4-naphthalenesulfonic acid dicalcium salt (TA-12) and 1-[2-dimethyl methoxycarbonyl methyl]naphthalene chloromethylate (TA-14) reduced the negative effects of the herbicides Glin-75, Glyphosate and 2,4-D, leading to lower levels of stress biomarkers and improved growth. Modulation of the enzymatic and non-enzymatic components of the antioxidant system also reduced oxidative stress. The protective effects of TA-12 and TA-14 under high temperature and polyethylene glycol treatment have

been studied in wheat, corn and peas, showing that these compounds helped to preserve growth, reduce stress markers and increase antioxidant activity. The personal contributions of the Candidate include performing biochemical analyses, determining enzyme activities, processing and visualising the results and drafting the publications with the candidate being the corresponding author in one of the publications.

**Research topic 3:** *Induction of stress tolerance in plants by means of natural and synthetic growth regulators* (Publications No. 5, 9, 10, 12, 15, 18)

Noteworthy are the studies on inducing stress tolerance in plants through natural and synthetic growth regulators. These investigations have demonstrated that abscisic acid and the phenylurea cytokinin 4PU-30 increased wheat resistance to drought, as evidenced by reduced levels of stress biomarkers and altered amounts of polyamines. Additionally, pretreatment with aliphatic polyamines has been found to improve wheat resistance to low-temperature stress, increasing the accumulation of free proline and reducing electrolyte leakage. Plant growth regulators are also effective against biotic stress factors; for instance, pretreatment with cytokinin 4PU-30 and the retardant MEIK reduced TSWV virus infection in tomatoes and peppers. Triacntanol also significantly eliminated viral infection in peppers. The personal contributions of Dr. Sergiev include developing ideas for growth regulator treatments, participating in experiments, analyzing samples, processing results and drafting articles. The Candidate is the corresponding author of publications related to biotic stress.

**Research topic 4:** *Interaction between natural and synthetic growth regulators in Arabidopsis under normal and stress conditions* (Publications No. 2, 3, 8).

The main achievements in this research topic include studying the phytohormonal regulation of plant growth and development and investigating the interactions between different phytohormones and growth regulators under optimal and suboptimal conditions using an ethylene-insensitive mutant (*eti5*) and wild-type Arabidopsis. The mutant *eti5* was found to be more resistant to high and low temperature stress compared to the wild type, which correlated with higher levels of polyamines. The role of polyamines and ethylene in stress tolerance was elucidated, demonstrating that their physiological functions in regulating growth and development are interrelated and determine the plant sensitivity to stress. It has been found that high-temperature stress has a greater impact on polyamine content compared to low-temperature stress. The effect of anticytokinins on leaf senescence was also studied, showing a reduction in the cytokinin-related delay of senescence in Arabidopsis leaves. The personal contributions of the Candidate include developing the research idea, performing biochemical analyses, processing and interpreting the results and drafting the publications.

**The future research directions** presented by Assoc. Prof. Sergiev are very well-founded and targeted towards important areas of plant ecophysiology. They include studies on the stress response of plants, the development of new agrochemical approaches to increase the resistance of agricultural crops to stress factors and the deepening of the understanding of phytohormone interactions. Additional information in these research areas could provide new solutions for optimising the use of growth regulators and phytohormones, and improving the effectiveness of agrochemical products. Expanding current studies on the effects of melatonin to include other crops and environmental conditions, as well as investigating the combined effects of this insufficiently studied regulator with other growth regulators, are very promising and interesting with the potential to aid the development of new biostimulants. All these studies are

related to increasing the resistance and productivity of plants in various agroecological conditions and contributing to more sustainable and efficient agriculture.

## **6. CONCLUSION**

The documents and materials presented by Assoc. Prof. Dr. Iskren Sergiev meet all the requirements of the Law on Academic Staff Development in the Republic of Bulgaria (LASDRB), the Regulations for the Implementation of (LASDRB), and the Regulations on the Specific Conditions and Procedures for Acquiring Scientific Degrees and Occupying Academic Positions at IPPG-BAS. For the participation in the competition, the Candidate has submitted a sufficient number of high-quality scientific papers. His works contain significant scientific contributions that have received international recognition through their publication in reputable journals, resulting in their high citation rate. The problems studied are relevant and have the potential to contribute significantly to the development of fundamental and applied research in the fields of plant physiology and agricultural sciences.

Based on these findings, as well as his exceptionally high project activity, well-defined research profile and the justified perspectives for future research, I confidently recommend to the members of the esteemed Scientific Jury to vote for the awarding of the academic position "PROFESSOR" to Associate Professor Dr. Iskren Georgiev Sergiev in the Field of Higher Education: 4. Natural Sciences, Mathematics, and Informatics, Professional Direction: 4.3 Biological Sciences, Scientific Specialty: Plant Physiology.

17.05.2024  
Sofia

Prepared by:  
Prof. Dr. Valya Vasileva