

REVIEW STATEMENT

On the competition for the academic position "Associate Professor"

Field of higher education: 4. Natural Sciences, Mathematics and Informatics

Professional field: 4.3 Biological Sciences

Scientific specialty: Plant Physiology

Candidate: Assistant Professor **Dr. Zornitsa Katerova-Landzhova**

Statement prepared by: Professor Dr. Liliana Georgieva Gigova

In the competition for the academic position "Associate Professor", announced in the State Gazette, no. 22/15.03.2024 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. Zornitsa Katerova-Landzhova, an Assistant Professor in the same laboratory.

Zornitsa Katerova-Landzhova graduated from the Faculty of Biology at Sofia University "St. Kliment Ohridski" in 1999 with a Master degree in "Biotechnological Processes" (specialization Industrial Biotechnologies). In 2009, she acquired the educational and scientific degree "Doctor" in the scientific specialty "Plant Physiology", based on a thesis developed and defended at IPPG - BAS on the topic: "Physiological-biochemical changes in pea plants, irradiated with UV-B and UV-C". From August 2009 until now, Dr. Zornitsa Katerova-Landzhova holds the academic position of "Assistant Professor" in the scientific specialty "Plant Physiology" at IPPG - BAS. The four specializations held in the period 2000-2016 in prestigious scientific organisations in Japan and Belgium contribute to the enrichment of her knowledge, experimental skills and experience. Throughout her research career, Dr. Zornitsa Katerova-Landzhova has published 43 articles, including 36 research papers, and 7 book chapters and review articles. Ten of the papers have been published in journals with quartile Q1, and 17 with Q2 (63% of all publications)! The total JCR impact factor (JCR IF) of the publications is 35,569; the total number of citations is 463, in Scopus: 188; Hirsch index 10 (Scopus). Part of the publications are based on the development of projects in which Dr. Katerova-Landzhova participated as a member of the scientific team (18 projects in total). Her scientific activity also includes participation in 16 national and international scientific forums with reports (2) and poster presentations (20). In the present competition Assist. Prof. Zornitsa Katerova-Landzhova presents **21** scientific publications, of which 3 are in Q1 journals, 7 in Q2 journals, 7 in Q3 and 1 in Q4 journals. The total JCR IF is **22.225**. The list of works for the competition also includes 3 book chapters. All featured publications are co-authored. Dr. Katerova-Landzhova is the first author in 10 publications and the corresponding author in another 2, which is an indicator of her substantial contribution. The presented list of noticed citations in the world databases Scopus and WoS for the last 5 years contains 173 references to 28 of the published scientific works, a testimony of their resonance among the world scientific community. The citing sources only for the publication in Genetics and Plant Physiology, 2011, are 31.

Dr. Katerova-Landzhova's research interests are focused on studying the physiological effects of ultraviolet radiation (UV-B and UV-C) and other abiotic stress factors (drought, waterlogging, herbicides) in economically important plants and opportunities to overcome their negative effects by applying growth regulators. Considering the deepening changes in the environment under the influence of climatic and anthropogenic factors and their negative impacts on the yield of agricultural crops, the studies of Dr. Katerova-Landzhova are timely and relevant. Dr. Katerova-

Landzhova has summarized her research activity in two complementary thematic areas, on the basis of which her scientific contributions and achievements can be systematized and evaluated.

The first research topic is focused on ultraviolet radiation (UV-B and UV-C) and is conditionally divided into 2 sub-topics - physiological effect on plants and possibilities to overcome its negative physiological effects through exogenous application of growth regulators (10 articles in total).

The effect of UV-B and the more damaging UV-C radiation applied once and every 4-5 to 21 consecutive days on dicotyledonous (peas and tomatoes) and monocotyledonous (triticale, wheat and barley) plants was established. By the change in the levels of the studied stress markers, oxidative stress-related antioxidants (enzymatic and non-enzymatic), as well as of the endogenous phytohormones and growth regulators, it was shown that the effect depends both on the length of the UV waves, as well as on the dose and duration of irradiation, the type and even the variety (for tomatoes) of the plants. The personal contributions of the Candidate include determining appropriate doses of UV-B or UV-C radiation depending on the objectives of the experiment; analysis of biochemical indicators; interpretation of the obtained data and drafting of a large part of the articles. Daily irradiation of plants with UV-C for a long period is an innovative approach, with the application of which defense mechanisms in plants have been successfully traced. The presented results of studies with pea plants suggest that the additional period of UV-C irradiation facilitates the pea to improve the recovery processes. Prominent are the studies on the effect of high doses of UV-C radiation on isolated nuclei from monocotyledonous and dicotyledonous plants. The lower levels of DNA double-strand breaks in wheat than in barley and pea, detected by the neutral comet assay, supported the hypothesis that plants with smaller genomes are more sensitive to UV-C irradiation.

Noteworthy are the studies on the protective action of exogenously applied growth regulators from different groups such as spermine (polyamine); MEIC, β -monomethyl ester of itaconic acid (retardant); "Biomin", containing humic acids and the auxin-like compounds TA-12 and TA-14 under UV-B and UV-C treatments of plants. Pretreatment of pea seedlings with spermine was found to reduce damage from high-dose UV-C irradiation by stabilizing cell membranes and activating non-enzymatic antioxidants, while promoting normal plant growth. In young wheat seedlings irradiated continuously or once with a high dose of UV-C, application of MEIA prior to UV-C resulted in reduced levels of the stress markers and increased amounts of non-enzymatic antioxidants. The effect of pretreatment with spermine was found to be comparable to that of MEIC, although the two growth regulators have different chemical structures and mechanisms of action, an interesting fact that raises questions. The protective effect of Biomin against UV-B-induced oxidative stress has been demonstrated in triticale plants. Pre-treatment with Biomin improves growth, increases antioxidants, and helps to normalize the levels of free amino acids and the content of polyamines in the leaves of irradiated plants. TA-12 and TA-14 were found to protect pea plants from the effects of UV-B irradiation by increasing the content of non-enzymatic antioxidants and stabilizing or enhancing the activity of antioxidant enzymes.

Research topic 2: "Study of physiological effect of other abiotic stresses in important crop plants and interaction with various growth regulators" (11 articles in total)

The main achievements in this research topic include the establishment of the physiological effects of adverse environmental changes on cereals treated with a selective herbicide and the finding of environmentally friendly substances for plant protection. In an original comprehensive study (the results are presented in 6 publications), it was found that the effects of the selective herbicide zerate on the physiological status and changes at the biochemical level (including the

amount of endogenous polyamines) of wheat and triticale after exposure to drought or waterlogging were opposite in the two plants and depended on their tolerance to the respective stress factor. The personal contributions of the Candidate include participation in plant cultivation, growth monitoring, biochemical studies, interpretation of data and writing of articles, of which she is the first author in 3 articles and the corresponding author in 1 article. New information has been obtained on the modulating effect of the brassinosteroid 24-epibrassinolide (EBL) in glyphosate-treated wheat. EBL pretreatment partially restores growth and has the potential to mitigate oxidative damage in herbicide-treated young plants by activating enzymatic antioxidant defenses and increasing total phenolics.

Outlined plans for future research show the clear vision of Dr. Katerova-Landzhova, for insufficiently researched, but interesting and promising aspects of her chosen research topic.

CONCLUSION

The documents and materials presented by Dr. Katerova-Landzhova for participation in the announced competition show that she not only fully meets, but in most categories exceeds the requirements for acquiring the academic position "Associate Professor", defined in the Law on Academic Staff Development in the Republic of Bulgaria and in the Regulations on the Specific Conditions and Procedures for Acquiring Scientific Degrees and Occupying Academic Positions at IPPG – BAS, namely: *Indicator A* - the required 50 points are covered by a defended dissertation for the award of the educational and scientific degree "Doctor"; *Group of indicators B*: the total number of points is 110 out of the required 100 points; *Group of indicators Γ* - the candidate submits 260 points out of the required 220. The number of points that are formed on the basis of scientific publications in group *Γ*, in which the candidate is listed as corresponding author and/or first author, is 185, against the required 110 points; *Group of indicators D* (specifically *D-II*) - with minimum requirements of 100 points, the candidate presents 346 points; *Group of indicators E* (specifically *E-14* and *E-15*) - the candidate presents 70 points, as many as required.

The valuable scientific production, the significance of the scientific contributions and the high citation rate of her works characterize Dr. Katerova-Landzhova as an established and internationally recognized scientist in the field of plant physiology and biochemistry. All this gives me a reason to support her candidacy and to confidently recommend to the respected members of the Scientific Council of IPPG-BAS to elect Assistant Professor Dr. Zornitsa Katerova-Landzhova for the academic position "Associate Professor" in the scientific specialty "Plant Physiology".

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Sofia

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