REVIEW

by Assoc. Prof. Georgi Nikolaev Bonchev, PhD
(Institute of Plant Physiology and Genetics - Bulgarian Academy of Sciences, IPPG-BAS)

regarding the competition for the academic position of "Associate Professor" in the professional field 4.3 Biological Sciences, scientific specialty Genetics, for the needs of the Laboratory "Regulators of Plant Growth and Development" l at IPPG-BAS, announced in issue 24 of the State Gazette on March 21, 2025.

Candidate: Dr. Krasimira Nedyalkova Tasheva, Assistant Professor in the Laboratory "Regulators of Plant Growth and Development", IPPG-BAS

Dr. Tasheva is the only applicant in the announced competition. The submitted documentation is fully compliant with the requirements of ADASRB and the Specific Requirements for the Academic Position "Associate Professor" as Reflected in the Rules of IPPG-BAS

1. General Information about the Candidate's Career and Thematic Development

Dr. Tasheva completed her higher education in 2000 at the Faculty of Biology, Sofia University "St. Kliment Ohridski," earning the qualification Master in Molecular Biology (specialization "Genetics"). Since 2001, she has been working at the Institute of Genetics – BAS, and in 2006 she began her full-time doctoral study. In 2011, she successfully defended her dissertation entitled: "*In vitro* propagation, preservation, and study of the potential to enhance the synthesis of biologically active substances in *Rhodiola rosea* L."

After receiving her Ph.D. degree, the candidate assumed the position of "Assistant Professor" at IPPG-BAS. Dr. Tasheva has maintained and further developed her scientific research interests in the development of innovative in vitro models for valuable and endangered plant species, employing modern biotechnological, genetic, and bioinformatic methods aimed at increasing plant productivity and modulating the biosynthesis of secondary metabolites. Her interest in the model species *Rhodiola rosea* (golden root) continues further, and she is a co-author of six publications submitted for the current competition. At the same time, the candidate has significantly expanded the range of studied plant species, including *Clinopodium vulgare L.*, *Sideritis scardica*, *Marrubium vulgare*, *Salvia aethiopis*, and others.

Dr. Tasheva demonstrates high scientific productivity, as evidenced by her co-authorship in **42** scientific publications across a broad range of journals, including **18** where she is the first or corresponding author. The total JCR Impact Factor of her publications is **60**. More than half of her publications are indexed in Web of Science (WoS) and Scopus. Notably, in the last five years, Dr. Tasheva has published **16** articles. Her research clearly shows an upgrade from the methodological development of protocols for *in vitro* plant propagation toward strong scientific-applied applications in the field of medicine.

During and after her PhD defence, Dr. Tasheva completed two specializations: a scholarship under the Financial Mechanism of the European Economic Area (EEA) in Oslo, Norway (2012) and a fellowship from the International Centre for Genetic Engineering and Biotechnology in Trieste, Italy (2010). In addition, she participated in another 25 short-term training courses between years 2007 and 2023. These activities reflect the candidate's strong commitment to developing her professional capacity.

2. Evaluation of the Submitted Report for Compliance with the Requirements of Article 26, Paragraph 1 of the Act for the Development of the Academic Staff in the Republic of Bulgaria (ADASRB) and the Specific Requirements for the Academic Position "Associate Professor" as Reflected in the Rules of IPPG-BAS

The analysis of the information available in the Web of Science and Scopus databases, along with the reports and supporting evidence submitted by the candidate, allows for the conclusion that Dr. Krasimira Tasheva's scientific output meets the minimum requirements set by the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB) and the Regulations of IFRG-BAS for the academic position of "Associate Professor". The points listed in the candidate's self-assessment for each of the indicators А, В, Г, Д, and Е are correctly calculated based on the criteria and conditions outlined in Appendix 1 of the IPPG-BAS Regulations:

Group A indicators (doctoral dissertation for the award of the educational and scientific degree "Doctor") – 50 points

Dissertation topic: "In vitro propagation, preservation, and investigation of the potential to increase the biosynthesis of biologically active substances in *Rhodiola rosea* L.", Scientific supervisor: Assoc. Prof. Dr. Georgina Kosturkova, IPPG-BAS

Group B indicators, indicator B-4 (scientific publications in journals that are peer-reviewed and indexed in Web of Science and Scopus) – **100 points** (minimum required: 100 points)
The points are based on **4 publications** in Q1 quartile journals with a total JCR Impact Factor of 14.1. In two of these publications, Dr. Tasheva is the first or corresponding author.

Group Г indicators, specifically Г7 and Г8 **– 237 points** (minimum required: 220 points)
Under Group **Г**, the candidate has submitted **13 publications**, including 5 in Q1**,** 1 in Q2**,** 3 in Q3, and 1 in Q4 journals, all of which indexed in both Scopus and Web of Science. Additionally, Dr. Tasheva presents **2** SJR-indexed articles, also listed in WoS and Scopus, along with a book chapter (as a co-author). In 7 of these publications**,** Dr. K. Tasheva is the first or corresponding author—specifically 2 in Q1**,** 1 in Q2**,** 3 in Q3 journals**,** and 1 book chapter**.** The total points earned from publications where Dr. Krasimira Tasheva is the first or corresponding author amount to **120 points**, which exceeds the minimum required 110 points**.**
The cumulative Impact Factor (IF) of the publications in **Groups B and Г**, according to the year of publication, is approximately **40**, which clearly demonstrates the high quality of the scientific output of the candidate and her co-authors**.** Nearly 50% of the publications (9 out of 17) are in Q1 journals.

Group Д indicators (citations) – **378 points** (minimum required: 100 points)
A total of 374 citations have been registered, with **189** citations in Web of Science (WoS) and Scopus (across 30 publications), according to the attached report generated from the Sonix database on May 12, 2025. Of the candidate's total publications, two from 2012 have the highest citation count, with one article (16, **Г7–11**) receiving 30 citations has been submitted for the current competition. Dr. Tasheva's h-index is 6, based on Scopus data as of June 2025.

Group E indicators, specifically E14–E18 (summarizing the candidate's project activity) – **120 points** (minimum required: 70 points)
Dr. Tasheva's autobiographical reference highlights her participation in a total of **18** national and international scientific research projects and initiatives since 2004, including two **COST** Actions.
For the competition, the candidate has submitted evidence of participation in the research teams of 3 nationally funded projects (**30 points**), one bilateral project between Bulgaria and India (DNTS/India 01/2) (**20 points**), and she is also the principal investigator of **2** national projects (**40 points**) funded by the Ministry of Education and Science (КП–06–N56/16, 2022–2026 and ДМУ 03/55, 2011–2013). The projects focus on the following topics: (1) Application of biotechnological and bioinformatics methods for *in vitro* biomass production from the endangered species *Rhodiola rosea*

(golden root) and enhancing the yield of biologically active substances; and (2) Investigation of the effectiveness of extracts from cultivated Bulgarian medicinal plants as potential therapeutic agents against socially significant diseases.

Including the funds attracted from the projects she leads (BGN 154,584 and **30 points**), Dr. Krasimira Tasheva accumulates a total of **120 points**, significantly exceeding the required minimum of 70 points. The total number of points from all indicators is **887**, thereby Dr. Krasimira Tasheva surpasses the minimum requirement (540 points) for holding the academic position of "Associate Professor" according to the Regulations of the Institute of Plant Physiology and Genetics – BAS.

3. Participation in Scientific Forums, Training, and Organizational Activities

The materials submitted for the procedure also include detailed information about the candidate's participation in scientific forums, educational initiatives, organizational activities and training activities as well as in science communication with the public.

a/ Participation in scientific forums and training courses:

From the documents submitted for the competition (Document 9: *Participation in scientific conferences and congresses*), it is evident that Dr. Tasheva has participated as a co-author in **40** national and international scientific forums since 2001. Her CV includes information about her active engagement in specialized training aimed at enhancing her own professional qualifications and acquiring new methodologies. She has taken part in **25** courses during the period 2007–2023.

b/ Organizational and Training Activities:

- At administrative level, Dr. Tasheva participates in two committees – the Committee on Academic Ethics at the Institute of Plant Physiology and Genetics (IPFG-BAS) and the Accreditation Committee for the Doctoral Program in "Genetics" at IPPG-BAS.
- The candidate actively takes part in events such as lectures and other public appearances aimed at popularizing and promoting research and scientific achievements, as well as their application and benefit to society and business, and at attracting young scientists – including the 2024 Career Forum at the Faculty of Biology, Sofia University; the 2023 "Science for Business" meeting; and the 2023 European Researchers' Night.

Training is an important part of Dr. Tasheva's work as a scientist. She has mentored three postgraduate trainees (Document 10: *Participation in other activities*), and has supervised the thesis work of one Master's and one Bachelor's student (Document 12: *Supervision of graduates* – excerpt from database Sonix).

4. Analysis of the main areas in the candidate's research work and the most significant results and achievements

For the current competition, Dr. K. Tasheva is presenting **17** articles with a total JCR Impact Factor **39,2**, in **10** of which she is the first or corresponding author. Based on the publications submitted for the competition and the author's contribution summary, it can be concluded that Dr. Krasimira Tasheva's scientific work is focused on developing innovative *in vitro* models for valuable plant species (medicinal, endangered), employing a multidisciplinary approach that incorporates modern biotechnological, biochemical, genetic and bioinformatic methods.

The covered research topics can be systematized into two main areas:

A. *Application of biotechnological approaches for developing in vitro cultures of valuable medicinal plants* to**:**

- Modulate the biosynthesis of secondary metabolites with antioxidant and protective properties;
- Conserve endangered species and preserve their gene pool.

The research in this area is reflected in 2 publications from **Group B** (B4-01, B4-02) and 7 publications from **Group Г** (Г7-06, Г7-08, Г7-09, Г7-10, Г7-11, Г7-12, Г8-01).

Dr. Krasimira Tasheva presents the following key contributions in this field:

- An effective micropropagation system for *Sideritis scardica* was developed to support the conservation of the species and assess its potential for future medicinal use. The obtained *in vitro* plants were successfully adapted in experimental field conditions and showed higher polyphenol content and better antioxidant activity compared to *in situ* cultivated plants (publication **B4-01**, research supported under project KP-06-N56/16).
- An effective micropropagation protocol for *Clinopodium vulgare* was developed, and for the first time, a comparative analysis was conducted on the phytochemical composition and antioxidant activity of extracts from different anatomical parts of *in vitro* cultivated and wild plants. Qualitative and quantitative differences were observed in the phenolic composition of the extracts. For example, the flavonoid catechin—one of the most powerful antioxidants—was detected only in the cultivated plants (publication **B4-02**, project KP-06-N56/16).
- By optimizing the nutrient medium composition for *in vitro* and *ex vitro* cultivation, new opportunities have been created for accelerated synthesis of biologically active substances in *Rhodiola rosea* in natural habitats, thus contributing to the conservation of this endangered species. It was demonstrated that *in vitro* cultivation does not alter the chromosome set compared to the wild type (Г7-06, Г7-09, Г7-12). A strong correlation was established between total phenolic content, flavonoid content, and radical scavenging activity (Г7-10). In one of her publications, Dr. Tasheva demonstrated the effective application of bioinformatic analysis of biological data using the QSAR model, particularly for determining conditions for effective biomass accumulation and establishing correlations between callus color and antioxidant production (Г7-08). This research builds upon the

theme of her PhD study on this species, and Dr. Tasheva is the principal investigator of the project funding this research.

The personal contribtion of the candidate in these studies and publications is related to conducting biotechnological experiments, phytochemical and cytological experiments, bioinformatics analyses, preparation and formatting of results for publications, as well as the responsible commitments in project management within which the aforementioned studies were conducted. Two of the publications for the competition are review articles revising the role of biotechnology in stimulating the synthesis of valuable secondary metabolites in *Rhodiola rosea* with results from personal experimental activity (**Г7_11**), as well as examining the biotechnological aspects (*in vitro* cultivation, development of micropropagation systems and obtaining callus cultures, metabolic engineering, and biotransformation) in research on endangered medicinal species from the genera *Rhodiola, Gentiana*, and *Leucojum* (chapter from book **Г8-01**).

Б. *Investigation of the efficacy of extracts derived from medicinal plants as prospective therapeutic agents for socially significant diseases, specifically Alzheimer's disease and oncological conditions*

The findings from the research in this area are documented in **4** publications from **Group B** (B4-01, B4-02, B4-03, B4-04) and **6** publications from **Group Г** (Г7-01, Г7-02, Г7-03, Г7-04, Г7-05, Г7-07), which can be categorized into two sub-areas:

- *Evaluation of the potential of extracts from medicinal plants for application in oncological disease therapy* (publications **B4-01, B4-02, B4-04, Г1-01**).

In vitro investigations focused on micropropagated and cultivated medicinal plants, including catnip (*Clinopodium vulgare*) (**B4-02, B4-04**), mountain tea (*Sideritis scardica*) (**B4-01**), and Mediterranean sage (*Salvia aethiopis*) (**Г1-01**), as well as the extracts derived from these species, on human tumor cell lines—specifically HeLa (cervical carcinoma), HT-29 (colorectal adenocarcinoma), MCF-7 (breast carcinoma), Hep-G2 (hepatocellular carcinoma), in addition to a non-tumorigenic (normal) cell line from mouse fibroblasts (BALB/3T3). It was shown that the extracts induce a concentration- and time-dependent decrease in cell viability, proliferation, and migration of tumor cells. Moreover, it has been demonstrated that *in vitro* micropropagated and cultivated *S. scardica* exhibit enhanced antitumor activity in comparison to those from wild counterparts. The results indicate that these plants, under optimized *in vitro* cultivation conditions, can synthesize bioactive compounds with antioxidant and antitumor properties comparable to, or potentially exceeding, those of wild plants, thus presenting a viable option for anticancer therapy.

- *Examination of the neuroprotective effects of extracts from medicinal plants in the context of Alzheimer's disease* (publications **B4-03, Г7-02, Г7-03, Г7-04, Г7-05, Г7-07**).

The neuroprotective effects of *in vitro* propagated and cultivated plants—*Marrubium vulgare* (**Г7-03**), *Clinopodium vulgare* (**Г7-02**), and *Sideritis scardica* (**Г7-02, Г7-04**)—known for their rich phenolic composition and diverse pharmacological effects, were evaluated in an *in vivo* model of scopolamine (Sco)-induced Alzheimer-type dementia in rodents (rats and mice). The application of extracts from these plants positively influenced the scopolamine-induced memory impairment. The extract from *M. vulgare* demonstrated neuroprotective effects and neuromodulatory properties, highlighting the plant's potential as a therapeutic agent for cognitive impairments in various neurodegenerative diseases, including enhancement of working memory and others (**В4-03, Г7-03**). Dr. Tasheva's personal contribution to these publications involved the generation of the *in vitro* plants, preparation of samples and extracts, participation in behavioral, physiological, biochemical, and molecular-genetic experiments, organization and structuring of the data and results for publication, as well as leading the research team conducting the studies.

In another study, Dr. Tasheva demonstrated the positive effect of plant extracts from *Plantago major* (broadleaf plantain) and *Calendula officinalis* (marigold), individually and/or in combination with snail mucus from *H. aspersa*, on more effective wound healing in an experimental rodent model. The results suggest a synergistic interaction among the three components (**Г7-07**).

Collaborations:

Based on the scientific publications, it is evident that Dr. Tasheva maintains active and susstainable collaborations with teams from other research institutions, including: the Institute of Neurobiology – BAS, the Institute of Experimental Morphology, Pathology and Anthropology with Museum – BAS, the Institute of Organic Chemistry with Centre of Phytochemistry – BAS, the Department of Information Technologies at the Faculty of Mathematics and Informatics – Sofia University, the Institute of Molecular Biology – BAS, University Hospital "Alexandrovska", and others.

5. Relevance of the candidate's scientific work and its significance for science and society

The candidate's interests in the development and advancement of innovative *in vitro* models for the propagation of valuable plant resources, through the application of modern biotechnological, genetic, and bioinformatic methods, have both theoretical and practical relevance for science and society:

- Enhancing the productivity of plants for the biosynthesis of secondary metabolites with antioxidant, protective, antitumor, and other properties, applicable in pharmaceuticals and medicine. Plant cell cultures remain the only economically viable method for producing valuable metabolites from rare and endangered plant species.
- Preservation and enrichment of genetic diversity for the sustainable conservation of endangered species.

- Dr. Tasheva's field of research has potential direct applications in medicine, cosmetics, and agriculture — particularly for the accelerated production of germplasm planting material from important medicinal species. This opens a wide avenue for developing effective partnerships with business stakeholders. Dr. Tasheva actively pursues this direction, as evidenced by her participation in events such as the annual "Science for Business" forum.

Prospects for future scientific development of Dr. Krasimira Tasheva

In her author's contribution summary, the candidate outlines her vision and plans for future development in specific research areas, guided by the broad interest and importance of studying plants and harnessing their full potential for the benefit of society.

Based on the research interests submitted by the candidate, a distinct focus emerges on studies with applications in medicine:

1. Expanding the capacity for the production of secondary metabolites through the development of *in vitro* cultures based on innovative methods such as biotransformation, elicitation, and others, for the production of environmentally friendly biomass aimed at obtaining high-quality, standardized extracts.

2. Studying the dynamics of metabolism and effective quantification of metabolic variations using NMR, gas chromatography-mass spectrometry, spectroscopy, and other analytical techniques, along with the isolation of bioactive compounds and the investigation of their individual and/or synergistic effects.

3. Exploring the antitumor effects of plant extracts and isolated bioactive compounds at the cellular and genomic levels.

4. Continuation and expansion of research through the application of molecular-genetic approaches to study the neuroprotective effects of plant extracts in *in vivo* and *in vitro* models of Alzheimer's disease, Parkinson's disease, and others.

5. Introduction of bioinformatic approaches and *in silico* methods to predict structure/biological activity correlations of plant substances and to model biochemical, physiological, and pharmacological systems.

6. Dr. Tasheva also plans to strengthen collaborations with scientific units in Bulgaria (including within the Institute of Plant Physiology and Genetics – BAS) and internationally, as well as to attract young researchers to the laboratory team.

Although Dr. Tasheva's research covers a several plant species (at least 7), the Bulgarian flora is rich in medicinal plants with unique phytochemical profiles, possessing numerous valuable

pharmacological properties. Therefore, the potential and opportunities for expanding this research area within IPPG–BAS and Bulgaria as a whole are substantial.

6. Critical remarks and recommendations

I have no critical remarks regarding the comprehensive information provided by Dr. Krasimira Tasheva in connection with the competition. The only remark is that in order to present in a more compact format, the information presented in Document 12 (*Supervision of Graduates*) and Document 11 (*List of Reviews*) could merged to Document 10 (*Participation in Other Activities*). In the document "Author's Contribution Summary," publication B4-01 is labeled as B1-04, which is most likely a typo made inadvertently.

Recommendations regarding the scientific work:

- The molecular-genetic analyses in Dr. Tasheva's publications include cytomorphological studies, fluorescence microscopy, and RT-PCR. It would be beneficial and informative in the future to apply genetic and epigenetic markers for: a) Identifying correlations between genetic/epigenetic diversity and the degree of biological activity of extracts; b) Genetically differentiation of ecotypes of within one and the same species with varying levels of biologically active potential; Detection of potential genetic variation induced in *in vitro* plants (callus cultures) compared to wild types (based on literature reports suggesting that tissue culturing can act as a stress factor capable of modulating plant genome structure and function).
- Work toward the practical application of results – patenting of protocols, developing business collaborations to promote their potential for practical use in medicine, cosmetics, agriculture, and other sectors.
- At national level, the candidate has established collaborations with several scientific partner organizations, but it is important to further develop such partnerships at international level as well as within IPPG-BAS. Suitable collaborators within IPPG-BAS include researchers from the Research Division "Molecular Biology and Genetics," who have expertise in studying the antitumor potential of medicinal plants and in the application of genetic and epigenetic markers.

7. Conclusions

The structured presentation of the application materials by Dr. Krasimira Tasheva for this competition, along with the detailed exposition of her scientific research, results, and activities, makes a very good impression and significantly facilitates the understanding and evaluation of the candidate's scientific profile. Dr. Tasheva's application clearly demonstrates that she is an specialist

with an established research profile and expertise. She has clearly defined goals to further develop and enhance her scientific expertise, both for her personal career growth and for strengthening the capacity of the Laboratory “Regulators of Plant Growth and Development” at IPPG-BAS.

The candidate shows initiative in developing a multidisciplinary approach in her research, integrating knowledge from various scientific fields (physiology, biochemistry, bioinformatics, cytology, molecular genetics) with the aim of achieving sustainable management of plant biodiversity and discovering bioactive products with potential therapeutic value. I do believe that the research topic is both interesting and promising for further development at IPPG-BAS, with the potential to attract more young scientists and PhD students. I am confident that the candidate will continue to work actively in this direction, which is also of particular importance for the development and strengthening of the research Division “Genetics” at IPPG-BAS.

Based on the review of her scientific activity and considering the potential for further development of the research areas she is engaged in, **I recommend that the esteemed Scientific Committee award Assistant Prof. Dr. Krasimira Nedyalkova Tasheva the academic position of “**Associate Professor” **in the scientific specialty “Genetics”** for the needs of the Laboratory “Regulators of Plant Growth and Development”.

28.06.2025

Sofia

Reviewer:

(Assoc. Prof. Georgi Bonchev)