OPINION

Regarding the holding of a competition for an "associate professor" in the professional field 4.3. Biological Sciences, scientific specialty Genetics, announced in the State Gazette No. 16 of 25.02.2025 with candidate Assistant Professor Dr. Maria Ivanova Petkova by Prof. Anelia Veneva Iantcheva DSc., appointed according to Order No. RD-01-16/22.04.2025 of the Director of the Institute of Plant Physiology and Genetics, BAS as a member of the scientific jury.

1. **Brief presentation of the candidate.**

Assistant Professor Dr. Maria Ivanova Petkova graduated the Faculty of Biology of Sofia University "St. Kliment Ohridski" in 2001 with a Master's degree in Biology and Chemistry, specialization Medicinal Plants. After graduation, she started work at the Institute of Genetics "Acad. Doncho Kostov", BAS and worked at this institute in the period 2003-2011. Her scientific research activity is focused on research for the development of methods for *in vitro* cultivation of medicinal and aromatic plants in order to increase their productivity. In the period 2011-2013, she was a doctoral student in independent training at the Institute of Plant Physiology and Genetics, BAS. The topic of her dissertation work for obtaining the degree "Doctor" in the scientific specialty Genetics is "Biotechnological approaches for propagation and obtaining biomass from "hairy roots" in *Arnica montana* L.", which she successfully defended in January 2014. As a assistant prof. in the "Regulators of Plant Growth and Development" laboratory at the same institute, her scientific research activity continues in the field of biotechnology of medicinal plants, studying the synthesis of biologically active substances in cell and tissue cultures and in genetically modified plants.

2. **General description of scientific production**.

The scientific production of Dr. Maria Petkova since the beginning of her scientific career includes 52 publications, of which 48 are scientific publications and 4 scientific reviews with a total impact factor of 59.230. In the competition for the academic position of "associate professor" 21 publications are presented in referenced and indexed world-renowned databases of scientific information with a total impact factor of 36.511. Among the journals in which the scientific works with the participation of the candidate have been published, are prestigious and highly indexed and referenced journals such as: *BMC Plant Biology, Plants, International Journal of Molecular Science, Agronomy, Turkish Journal of Biology, Acta Physiologiae Plantarum*. According to the Scopus database, the "Hirsch index" "h-index" of Dr. Maria Petkova is 9. The distribution of scientific publications by quartiles according to the SCOPUS database is as follows: 7 publications with quartile Q1; 5 publications with quartile Q2; 4 publications with quartile Q3; 3 publications with Q4 and two publications from other databases without quartile. According to the report on the implementation of Minimal National Requirements of the Law of The Development of Academic Staff of Republic of Bulgaria and the regulations for its implementation at the Institute of Plant Physiology and Genetics, BAS for professional direction 4.3. Biological Sciences Dr. Maria Petkova meets and exceeds the minimum requirements. With a required minimum of 540 points, for the academic position of "associate professor", the candidate possess 928 points.

For the preparation of the opinion, scientific research activity reflected in 21 scientific papers, as well as project and training activities are subject to analysis.

3. Scientific research activity.

According to the submitted report on scientific contributions, the candidate divides the contributions of her scientific production into two main scientific directions with an original scientific-fundamental

and scientific-applied nature: Direction 1: Development and optimization of highly effective *in vitro* protocols for propagation, biomass production and synthesis of biologically active substances from medicinal plants of the *Asteraceae* family. 2. Modulation of the synthesis of biologically active substances through gene transfer or application of elicitors of abiotic and biotic origin in medicinal plants of the *Asteraceae* family. The first scientific direction includes 11 publications under the numbers (**B4-4, B4-5, B4-6, G7-3, G7-6, G7-9, G7-10, G7-12, G7-13, G7-14, G7-15**) from the report with minimum requirements. These publications reflect the personal participation of the candidate, as well as her contribution to the scientific team for the development and optimization of protocols with the application of plant growth regulators for effective and accelerated micropropagation. Obtaining plant material for the needs of the pharmaceutical industry from the endangered plant species *Arnica montana* L. (mountain arnica) and *Helichrysum arenarium* (L.) Moench (yellow smil), as well as economically important species *Steviare baudiana* Bertoni (stevia), *Echinacea purpurea* (L.) Moench (echinacea), *Cichorium intybus* L. (chicory) is the main scientific and applied task of the candidate. The developed technology for creating plantations of the endangered mountain arnica species obtained by *in vitro* cultivation, which preserve and exceed the amounts of synthesized sesquiterpene lactones after acclimatization and planting in mountain conditions, is of an original character and personal contribution of the candidate. The study and for the first time the application of the phenylurea cytokinin 4PU-30, which effectively induces regeneration and prevents hyperhydration of plant tissues during *in vitro* propagation of chicory, is also of original nature. In the above-mentioned publications, the biosynthesis of biologically active substances (BAS) has been traced according to the type of nutrient medium used, the propagation method, the age and phase of development and the origin of the starting plant material, which provides valuable information of a fundamental and applied nature for the biology and phytochemistry of the studied plant species.

The second direction of the candidate's scientific research activity is aimed at modifying the synthesis of BAS in medicinal plants of the *Asteraceae* family, through the methods of gene transfer or the application of elicitors of abiotic or biotic origin. These results of the scientific research activity are reflected in publications (**B4-1, B4-2, B4-3, G7-1, G7-2, G7-4, G7-5, G7-7, G7-8, G7-11**) from the report with min. requirements. The not-true roots “hairy roots” from the medicinal plant *Arnica montana* are a product of genetic transformation with *Agrobacterium rhizogenes* wild type and are the one main plant material in this scientific direction, skillfully used by the candidate. The study tracking the influence of the biological elicitor yeast extract and the abiotic elicitor salicylic acid on the antioxidant potential and the accumulation of caffeoylquinic acids in this medicinal plant is of original scientific fundamental and applied contribution. The stimulating influence of the biotic and abiotic elicitor on activating the synthesis of secondary metabolites and antioxidants has been proven. Again, after applying the elicitors yeast extract, salicylic acid and methyl jasmonate to *in vitro* shoots of *Arnica montana*, the stability of expression of nine genes was assessed for the first time, which could be used as reference genes in assessing the expression of studied genes. The use of nanofibers to increase the efficiency of regeneration through direct organogenesis, the antioxidant capacity and the amount of sweet diterpene glycosides - stevioside and rebaudioside A in stevia is an innovative approach noted in publications /**B4-3, G7-4, G7-1**/ with the active participation of the candidate. The influence of the addition of the amino acids creatine and the synthesized form creatine-lysinate was studied, which favorably affects the accumulation of biomass and the activity of antioxidant enzymes in *in vitro* cultures of stevia and edelweiss. The significance of the fundamental results achieved by the candidate in this scientific direction, which shed light on the physiological, biochemical and metabolic changes in *in vitro* cultivation of medicinal plants by applying elicitors and nanofibers, is summarized in three literature reviews /**G7-5, G7-8, G7-2**/, and Dr. Petkova is a lead author in one of them.

4. Relevance of the scientific topic.

Dr. Petkova's scientific research activity is focused on the rapidly developing area of application of biotechnological and genetic approaches to medicinal and aromatic plants in order to propagate and obtain biomass from economically important, rare and endangered plant species of the *Asteraceae* family. Her research is also focused on modulating the synthesis of valuable biologically active substances with applications in medicine, pharmacy, food and cosmetic industries. Proof of the significance and perspective of her scientific research activity is the publication and citation of the results obtained in journals indexed by the world-famous Web of Science and Scopus databases. The candidate's planned future scientific research activity is focused on applying new strategies to increase the biosynthetic potential of plants, optimizing the synthesis of target secondary metabolites and striving for a deeper understanding of the molecular-genetic, physiological and biochemical features of plants. This direction of scientific research is of priority importance for our country and the European Scientific Area due to its connection to human health and well-being, as well as to the continuous expansion of the demand for natural plant products for the growing market of plant raw materials.

5. Organizational and educational activities.

Of great importance for the development of Dr. Petkova as an expert in her scientific research field is her leadership and participation in numerous scientific projects and international and national scientific forums. The scientific projects in which the candidate is a leader and participant are funded by the National Science Fund, bilateral cooperation, operational programs of the Ministry of Education and Science, and the Ministry of Environment and Waters. A total 42 participations in international and national scientific forums with posters and reports are noted. Further evidence of the candidate's contributions to scientific research activities is her three-month specialization at VTT, Espoo, Finland, an attached certificate proving her participation in educational activities, as well as a reviewer in prestigious and highly indexed and refereed scientific journals.

6. Conclusion.

Based on the analysis of the candidate's scientific fundamental, scientific-applied and organizational activities, I believe that Asst. Prof. Dr. Maria Ivanova Petkova meets the requirements of the Law of The Development of Academic Staff of Republic of Bulgaria, and the regulations for its implementation at the Institute of Plant Physiology and Genetics, BAS. Based on all the facts presented, I can determine Asst. Prof. Dr. Maria Petkova as a complete expert in the field of plant biotechnology in medicinal, and aromatic plants, and a well-established researcher. All this gives me reason to evaluate POSITIVELY her overall activity. I would like to propose that the esteemed Scientific Jury also vote positively, and that the Scientific Council of the Institute of Plant Physiology and Genetics elect Asst. Prof. Dr. Maria Petkova as an "associate professor" in the scientific specialty Genetics.

Date:28.05.2025 Opinion prepared by:……..

Sofia (Prof. Anelia Iantcheva DSc.)