



## SCIENTIFIC OPINION

by Prof. Petya Koycheva Hristova, PhD

According to the documents of the competition for the academic position "Associate Professor" in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.3. Biological Sciences, scientific specialty "Microbiology/Enzymology", announced in the State Gazette, issue 84 of 04.10.2024.

### 1. General presentation of the procedure:

The competition for "Associate Professor" in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.3. Biological Sciences, scientific specialty "Microbiology/Enzymology" was announced for the needs of the Department of "General Microbiology", Laboratory "Microbial Chemistry" of the Institute of Microbiology and Informatics of the Bulgarian Academy of Sciences in the State Gazette No. 84 of 04.10.2024. The scientific jury was formed by order No. I-162/26.11.2024 on the basis of the Law on the State of the Republic of Bulgaria, the Regulations of the Bulgarian Academy of Sciences for the implementation of the Law on the State of the Republic of Bulgaria and the Regulations on the conditions and procedure for acquiring scientific degrees and occupying academic positions at the Institute of Microbiology at the Bulgarian Academy of Sciences. The procedure for opening and announcing the competition provided for in the law and the Regulations has been complied with and all necessary documents have been submitted on time. The competition documentation is well organized and fully reflects the candidate's multifaceted educational and research activities.

### 2. Biographical data, career development and professional qualities of the candidate

The only candidate who submitted documents for participation in the competition for the academic position of Associate Professor in Professional Field 4.3. Biological Sciences, specialty Microbiology/Enzymology is Assistant Professor Dr. **Yana Gancheva Gocheva**.

The candidate graduated from the Faculty of Biology of Sofia University with a degree in Biotechnological Processes in 1993. In 1997, she won a competition for a doctoral student at the Department of General and Industrial Microbiology at the Faculty of Biology. In 2002, Yana Gocheva successfully defended her doctoral dissertation on the topic: "Study on the influence of Ca<sup>2+</sup>-binding proteins on the differentiation of *Streptomyces hygroscopicus* 155". During the period 2000-2006, she worked as a research associate in the "Mycology" section of the Institute of Microbiology and Biotechnology. The candidate's scientific knowledge was expanded when she took the position of research associate at ELBI Bulgaricum for the period 2007-2008. After a certain break since 2016, Yana Gocheva's scientific career continues as an assistant professor in the Department of General Microbiology to the present.

The presented biography and scientific works demonstrate a deep interest and accumulated professional experience in various current issues in microbiology.

The candidate's professional growth is associated with expanding and upgrading knowledge through targeted qualifications. While still a research associate (2003-2004), Dr.

Gocheva participated in a postdoctoral specialization in France, after which she continued her studies in a postdoctoral specialization in Israel (2006-2007). Since 2022, Assist. Prof. Gocheva has been an external evaluator at the National Innovation Fund.

### **3 Evaluation of the candidate's scientific output and scientific metrics**

Dr. Yana Gocheva has submitted all the documents required for the competition in accordance with the requirements of the Law on the Competition of the Republic of Bulgaria and the Regulations of the University of Sofia. They are presented for evaluation in a clear and systematic manner with a clear distinction.

#### **3.1. General characteristics and evaluation of the scientific publication activity**

The scientific output of Assist. Prof. Gocheva is represented by a total of **32** scientific publications with a total impact factor of **41.502** and **9** participations in national and international forums. It is noteworthy that the publications are mainly in areas affecting various current problems of microbiology, which are in strict accordance with the topic of the competition.

#### **3.2. Evaluation of citations of scientific works**

The Scopus database contains **26** articles in refereed and indexed journals of the candidate, which have been cited (excluding self-citations) a total of **198** times. Of these, **112** citations are submitted for the competition. The citation index h-factor is **7** (according to Scopus).

#### **3.3. Evaluation of the implementation of the minimum national requirements for the relevant scientific field**

The minimum national criteria according to the Law on the State of the Republic of Bulgaria are fully met by the presented scientometric indicators:

According to **Indicator B** In the requirement of 100 items. is fully fulfilled by the submission of 7 publications, of which 3 with Q1, 2 with Q2 and 2 with Q3, which determine **145** points.

According to **Indicator G**, evidence is presented for **252** points out of the required 200 minimum points, which are formed by 14 articles and 1 book chapter, of which 2 - Q1, 5 - Q2, 1 - Q3 and 6 - Q4.

According to **Indicator D**, evidence is presented for 112 citations, which give **224** points and exceed the minimum criterion of 100 points.

#### **3.4. Evaluation of the implementation of the additional criteria of IMikB**

Based on the submitted report for the assessment of the fulfillment of the additional criteria of the IMikB, it is evident that the candidate not only fulfills, but also exceeds the set criteria. Dr. Yana Gocheva has 28 publications after the ONS "Doctor", a twice higher impact factor and a citation coefficient of 7 on Scopus.

#### **3.5. Evaluation of the candidate's project activity**

The submitted reference shows the candidate's active participation in national and international projects. Evidence of participation in 5 projects is presented, 3 of which are funded by the National Science Foundation at the Ministry of Education, Science and Culture, 1 is an international project funded by the European Space Agency and 1 is an internal project funded by the Institute of Microbiology. This project activity proves not only the scientific but also the organizational qualities of the candidate. The candidate has participated in 2 external projects for the unit and 1 ERASMUS + grant.

**Conclusion on item 3:** *The candidate in the current competition for the academic position of "Associate Professor" Assist. Professor Dr. Yana Gocheva meets the minimum criteria of the Law on the State of the Republic of Bulgaria and the Regulations for its implementation and exceeds them (671 total points).*

#### **4. Evaluation of the applicant's original scientific contributions**

The research reflected in the **21** scientific papers submitted for the competition is in the field of applied microbiology and can be attributed to the following main areas:

- ✓ Study of temperature and oxidative stress in filamentous fungi isolated from Antarctica and the role of enzymes such as catalase and superoxide dismutase
- ✓ Studies on lactic acid bacteria and their antibacterial activities;
- ✓ Research on new enzymes and their potential applications from various bacterial and fungal producers
- ✓ Studies on the degradation of cellulose waste by microorganisms
- ✓ Studies on the microbiome of reptiles in Bulgaria

The contributions of scientific research can be systematized as follows::

#### **1. Investigation of temperature and oxidative stress in filamentous fungi isolated from Antarctica and the role of enzymes such as catalase and oxide dismutase**

In this direction, the diversity of filamentous fungi in Antarctica has been studied and the obtained data on the dominance of representatives of the genera *Penicillium*, *Aspergillus*, *Mucor*, *Cladosporium*, *Alternaria*, *Verticillium* and *Botrytis* have important theoretical and practical applications. Of even greater impact are the new knowledge obtained regarding the mechanisms of their adaptation to conditions of low temperature and oxidative stress. In these studies, strains with the potential for the production of enzymes with unique characteristics have also been selected.

The influence of stress conditions on other eukaryotic model organisms such as yeast has been studied. The role of the Pac2 protein in the formation of the quaternary structure of proteins under stress conditions has been proven due to its ability to vasomodulate with the microtubules of the cytoskeleton and proteasomes.

#### **2. Studies on lactic acid bacteria and their antibacterial activities.**

Studies have been conducted on both the biodiversity of lactic acid bacteria from boza and their antibacterial potential. In the course of these studies, a strain of *Lactococcus lactis* sbsp. *lactis* 14, a nisin producer, was isolated and characterized. The new strain has a broader spectrum of activity against both Gram-positive and Gram-negative pathogens, making it a potential biocontrol agent.

This direction also includes studies of the metabolic activities of lactic acid bacteria and their aromatic characteristics, which are the basis for the selection of strains suitable for use in functional foods and supplements. Genes that give technological advantages to the strains have been identified.

#### **3. Research on new enzymes and their potential applications from various bacterial and fungal producers**

##### **3.1. Construction of a recombinant enzyme with application in the creation of biosensors**

In this work, a stable recombinant enzyme – malate quinone oxidoreductase – was constructed, expressed, purified and characterized, which is the basis for creating biosensors for

monitoring and controlling fermentation in wine production. The designed amperometric biosensor has important practical significance.

### **3.2. Studies on sialidases of bacterial origin**

Extensive research has been conducted on the production, isolation, purification and characterization of sialidases involved in the degradation of sialic acids. For the first time, a scheme for the safe production of sialidase from the non-pathogenic saprophyte *Oerskovia paurometabola* has been developed, which represents an important applied contribution. Also, data on the inhibitory effect of extracts from *Rosa damascena* and *Origanum vulgare* ssp *hirtum* and some natural compounds on bacterial sialidases derived from *Vibrio cholerae* non-O1, *Arthrobacter nicotianae* and *Oerskovia paurometabola* have also been obtained for the first time. These results are of theoretical and applied importance in the development of new antimicrobial therapies and prevention of various diseases.

### **3.3. Studies on Sialidases of Fungal Origin**

New information has been obtained about the distribution of the sialidase enzyme in a previously unexplored taxonomic group of microorganisms such as filamentous fungi.

The role of catabolite repression and the mechanisms of regulation of enzyme synthesis in filamentous fungi have been studied for the first time. For the first time, increased sialidase activity as a result of oxidative stress has been demonstrated in a filamentous fungus. A promising strain of *Penicillium griseofulvum*, isolated from Antarctica, has been selected, and for the first time, optimization of its cultivation parameters for sialidase synthesis has been achieved, as well as a protocol for purification and characterization of the enzyme. The relationship between sialidase synthesis and oxidative stress has been studied for the first time. Information has been obtained about the cellular response of *P. griseofulvum* P29 to low temperature exposure. An increase in the level of stress biomarkers and acceleration of antioxidant enzymes has been demonstrated. For the first time, increased sialidase activity as a result of oxidative stress has been demonstrated in a filamentous fungus.

### **4. Studies on the degradation of cellulose waste by microorganisms.**

The research is focused on the isolation and characterization of microbial communities and single colonies with cellulose-degrading activity. A maximum degradation rate of up to 72% was achieved on the 17th day under mesophilic cultivation conditions and pretreated paper as a model substrate. When optimizing the process in a bioreactor with controlled conditions, the degradation reaches 82%.

For the first time, the microbiological degradation of cellulose waste and its transformation into important resources under conditions of Earth gravity and microgravity (space station model) by mixed bacterial communities and pure cultures isolated from different ecological niches have been compared.

### **5. Studies on the microbiome of reptiles in Bulgaria**

For the first time, information of important theoretical importance has been obtained regarding the microbiome of reptiles from the territory of Bulgaria. When studying the microbiome of lizards, it was found that among the most common bacterial species were *Hafnia alvei*, *Pseudomonas aeruginosa*, *Klebsiella oxytoca* and representatives of *Enterobacter* spp., *Citrobacter* spp. and *Enterococcus* spp. The monitoring of various virulence factors showed that most isolates pose a relatively low risk to human health.

In view of the data presented above, the following conclusion can be made:

## CONCLUSION

I highly appreciate the research and project activities of r Assist. Professor Dr. Yana Gancheva Gocheva. I believe that the candidate meets all the requirements of the Law on the State of the Republic of Bulgaria and the Regulations for its implementation.

**I strongly suggest to the respected scientific jury to evaluate the candidacy of Assist. Professor Dr. Yana Gocheva and to vote positively for her to occupy the scientific position of "Associate Professor" in professional field 4.3. Biological Sciences, specialty Microbiology/Enzymology.**

Sofia  
13.01.2025 г.

Prepared the opinion: .....  
prof. Petya Hristova, PhD