

REVIEW

By Dr. Penka Angelova Moncheva, prof., SU "St. Kliment Ohridski" - Faculty of Biology
On the materials submitted for participation in a competition for the academic position of "associate professor" at the Institute of Microbiology "Stefan Angelov" at the Bulgarian Academy of Sciences
In Area of higher education 4. Natural sciences, mathematics and informatics;
Professional field 4.3. Biological Sciences (specialty Microbiology/Enzymology)

In the competition for "associate professor", announced by the "Stefan Angelov" Institute of Microbiology at the BAS in the SG 84/04.10.2024 for the needs of the Department of "General Microbiology", the Laboratory of Microbial Biochemistry, Assistant professor Dr. Yana Gancheva Gocheva is the only candidate that submitted document for this competition.

1. General presentation of the received materials and assessment of the fulfillment of the minimum national requirements and the additional requirements of the Institute of Microbiology „Stefan Angelov” by the candidate in the competition for the academic position of "Associate Professor"

By order No. I-162/26.11.2024 of the Director of the Institute of Microbiology "Stefan Angelov", I have been appointed as a member of the scientific jury of a competition for the academic position of "associate professor" in the same institute in professional field 4.3. Biological Sciences (specialty Microbiology/Enzymology), announced for the needs of the Department "General Microbiology", Laboratory "Microbial Biochemistry.

The only candidate for participation in this competition, Assist. Prof. Dr. Yana Gancheva Gocheva from the Institute of Microbiology, has submitted all necessary documents required according to Art. 19 of the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB) and Art. 58(2) of the Regulations on the Conditions and Order for Acquiring Scientific Degrees and for Holding Academic Positions at the "Stefan Angelov" Institute of Microbiology at the BAS.

Assist. Prof. Dr. Yana Gocheva has presented a list of a total of 32 scientific works with a total impact factor of 41.502. Three of the works are publications related to Dr. Gocheva's doctoral thesis and are not subject to review. The remaining 29 works submitted for participation in the competition for the academic position "associate professor" are grouped as follows - 28 scientific articles, 5 of which are reviews and 1 collective monograph. With the exception of the collective monograph and 1 article, the presented works were published in English. Twenty (20 items) of the scientific articles have been published in journals, refereed and indexed in world-renowned databases of scientific information (Web of Science and Scopus) and have SJR/IF, and depending on the quartiles are distributed as follows: 5 – in Q1, 6 – in Q2, 3 – in Q3 and 6 – in Q4. Among the scientific journals in which they are published, I would note *Cellular and Molecular Life Sciences* (IF 7.68, Q1), *Molecules* (IF 4.927, Q1), *Journal of Fungi* (IF 4.2, Q1), *Biosensor and Bioelectronics* (IF 4.132, Q1), *Fungal Biology* (IF 3.13, Q1), *Life* (IF 3.2, Q2), *Applied Sciences* (IF 2.838, Q2), *Biochemistry and Biophysics Reports* (IF 2.4, Q2). Two of the publications are without SJR, but have been published in journals, refereed and indexed in Scopus. The remaining 6 publications were published in non-refereed and indexed scientific journals. All scientific works of Dr. Gocheva are collective. In 8 of them she is the first author, 7 of which were published in refereed and indexed journals. For participation in the competition for she is submitted a list of 112 citations of her publications, which meet both the minimum and additional requirements for this position. The total number of citations of Dr. Gocheva's entire scientific career is 195 (Scopus), respectively 166 (excluding self-citations), with an h-index of 7 (Scopus) and 8 (Google Scholar).

Assist. Prof. Dr. Gocheva has participated in 9 scientific forums, of which 3 are international (with 2 scientific reports and 2 posters) and 6 national (with 2 reports and 5 posters). She has participated in 8 scientific projects, two of which are personal participations in projects external to the Institute of Microbiology.

The review of the submitted documents for participation in the competition shows that Dr. Gocheva not only meets, but also significantly exceeds (with almost 63% higher number of points than the required) the minimum national requirements for holding the academic position "associate professor", determined by the ADASRB, as follows:

Group of indicators	Contents	Requirements for the academic position „associate professor“	Fulfillment by the candidate
A	Indicator 1	50	50
V	Indicator 4	100	125
G	Sum of indicators from 5 to 10	200	252

D	Sum of points in indicator 11	50	224
Total		400	651

Dr. Gocheva also meets and exceeds the additional requirements of the Institute of Microbiology for this position, as follows:

Indicator	Requirements of the Institute of Microbiology	Fulfillment by the candidate
Number of publications in journals with IF/SJR, monographs, chapters of monographs, proceedings of international forums published in full text, patents	20 (after "doctor") In 5 of them, first author or corresponding author	21+2 (in journal refereed and indexed in Scopus without IF/SJR) In 7- first author
Citations for the entire scientific career	100	166
IF for the entire scientific career	20	41.502
h-index for the entire scientific career	5	7 (Scopus);8 (Google Scholar)
Participation in projects	3	5

2. Brief biographical data about the candidate

Assist. Prof. Yana Gocheva obtained a Master's degree in "Biotechnological processes" in the Faculty of Biology at Sofia University St. Kl. Ohridski" in 1993. Between 1997 -2001 she is a full-time doctoral student at the Department of General and Industrial Microbiology, developing a dissertation on the topic "Studies on the role of calcium-binding proteins in the differentiation of *Streptomyces hygrosopicus* 155", which she defended in 2001 and received the educational and scientific degree "doctor". She has successively held the following positions - research assistant in the section Mycology of the Institute of Microbiology (2000-2002; 2004-2006), research assistant in the Laboratory for Research and Development at ELBI Bulgaricum (2007-2008), executive director /expert projects of ET "Personal Consult - Gancho Popov" (2009-2016) and assistant professor at the Institute of Microbiology (2016 to date). In the meantime, she has realized two postdoctoral studies - in Labege (France) - GTP Technology (2003-2004) and at „Ben Gurion“University, Beersheva (Israel), Department of Natural Sciences. In 2013-2014 Dr. Gocheva completed a master's degree in International economic relations - International Project Management at UNWE, Sofia, where she received theoretical and applied knowledge in the field of project preparation, risk analysis and management, communication and presentation skills, team management, conflict management, etc. From the above, I could conclude that the professional realization of Dr. Gocheva is related not only to scientific and educational activity, but also to a business organization - scientific and development activity, which is the result of her education and application of the acquired knowledge.

3. Evaluation of the scientific and scientific-applied activity

3.1. Characteristics of scientific and publication activity

For participation in the competition, Dr. Gocheva has presented 29 scientific works, which are in the scientific field of the competition for the academic position "assoc. prof." in professional field 4.3. Biological Sciences (Microbiology/Enzymology). The scientific research carried out by her could be grouped into several scientific directions, as follows:

Study of temperature and oxidative stress in filamentous fungi isolated from Antarctica and the role of the enzymes catalase and oxide dismutase

Dr. Gocheva's research in this scientific area is related to the isolation of filamentous fungi from Antarctica and their identification. The following genera have been identified, represented by the largest number of species – *Penicillium*, *Aspergillus*, *Mucor*, *Cladosporium*, *Alternaria*, *Verticillium* and *Botrytis*. The cellular response of filamentous fungi to low-temperature stress and temperature-dependent modifications in colony growth and morphology were investigated. The activity of the protective enzymes superoxide dismutase and catalase, as well as the accumulation of reserve carbohydrates were investigated (papers №№. 8, 9 and 10 from list 6).

Publication № 11 (from list 6) could also be referred to this scientific direction, in which studies were conducted on the formation of misfolded protein molecules under stress conditions in stress-sensitive yeast model strains in which the gene encoding protein pac2D has been removed. A new role for the Pac2 protein in the formation of misfolded proteins under stress conditions has been proposed, based on its ability to interact with both the microtubule cytoskeleton and the proteasomes.

Dr. Gocheva's works related to this scientific direction have been published in journals with high metric indicators, such as *Cellular and Molecular Life Sciences* (Q1), *Extremophiles* (Q2), *Mycological Research* (Q2) and all of them have been cited, with the total **number of their citations being 91**.

Studies on lactic acid bacteria and their antibacterial activities

In this scientific field, research was carried out on the microflora of bosa. The antibacterial activity of the isolated lactic acid bacteria was analyzed, and 33 of the isolated species were found to be active against various test-microorganisms. The species with the highest activity and broadest spectrum of action was selected and its growth characteristics were determined, as well as the cultivation conditions affecting its ability to synthesize bacteriocin. An initial purification of the antimicrobial substance was carried out (paper № 7 of list 6).

With PCR specific techniques, cultures of lactococci from the ELBI collection were characterized and genes that gave the strains a technological advantage were determined (article № 2 of list 6).

Publications in this direction have received **24 citations** in publications, refereed and indexed in Scopus.

Studies on new enzymes and their potential applications from various bacterial and fungal producers

This direction unites the largest number of scientific works of Dr. Gocheva - 9 articles (1 of which is a review) and 1 collective monograph, which summarize research results with an emphasis on sialidases synthesized by different groups of microorganisms (bacteria, actinobacteria and fungi). The majority of them were published in journals with very high metrics – 4 in Q1 journals and 1 – in Q2. Since the majority of these works were published in the last 1-2 years, the total number of their **citations is 37**. I have also included the review article (publication № 14 of list 6) here, since it summarizes scientific information about the potential of filamentous fungi isolated from saline ecosystems as producers of biologically active substances, including enzymes.

Scientific works in this field could be differentiated into the following subfields:

Construction of a recombinant enzyme with application in the creation of biosensors

A stable recombinant enzyme, malate quinone oxidoreductase, which is a key functional component in the creation of biosensors used for fermentation control in winemaking, has been constructed, expressed, purified and characterized. With the obtained active and stable enzyme preparation, an amperometric biosensor was created (article № 1 of list 6).

Sialidases of bacterial origin

The production of extracellular sialidase from the species *Oerskovia paurometabola*, a representative of actinobacteria, was investigated through a developed laboratory purification protocol. Basic characteristics of the enzyme and its safe production by the producer were studied (publications №№ 3 and 4 of list 6). Studies have been conducted on the inhibitory effect of extracts from *Rosa damascena* and *Origanum vulgare* ssp *hirtum* and natural compounds on the activity of sialidases from the species *Vibrio cholerae* non-O1, *Arthrobacter nicotianae* and *Oerskovia paurometabola* (articles №№ 17, 18 from list 6).

Sialidases of fungal origin

This subfield brings together research on the distribution of the enzyme sialidase in filamentous fungi and the role of the regulatory mechanism catabolite repression on its activity. The relationship between sialidase synthesis and oxidative stress was investigated. The cellular response of the producer strain *Penicillium griseofulvum* P29, isolated from Antarctica, to low temperature exposure was investigated. A purified enzyme preparation was obtained and its characteristics were studied (papers №№ 5, 6, 13 and 21 of list 6).

The collective monograph, in which Dr. Gocheva is a co-author, unites research on the project "New enzymes from the group of sialidases in filamentous fungi", financed by the Bulgarian National Science Fund at the Ministry of Education and Science with a research team from the Institute of Microbiology, the Institute of Organic Chemistry with Center in Phytochemistry and the Institute of Experimental Morphology, Parasitology and Anthropology with a Museum at the Bulgarian Academy of Sciences, as well as researchers from the University of Tusha, Italy. The monograph is structured in 6 chapters, in which new scientific information and research results of the team are presented on the following issues: Distribution of the sialidase enzyme among filamentous fungi isolated from non-clinical substrates; Distribution of the sialidase gene in sialidase-positive and sialidase-negative strains; Mechanisms regulating sialidase synthesis; Synthesis of the enzyme sialidase under conditions of oxidative stress induced after exposure to temperature; Purification of the sialidase enzyme from

Penicillium griseofulvum P29 (Antarctic isolate); Structural and functional properties of a new sialidase of fungal origin

Degradation of cellulose waste by microorganisms

Research in this scientific direction is focused on the isolation and characterization of microbial communities and single colonies of microorganisms with cellulose-degrading activity. Aerobic, anaerobic and microaerophilic communities with cellulolytic activity have been isolated from various ecological niches. A laboratory procedure for the degradation of cellulose waste has been established. The obtained results contribute to the recovery of waste and its transformation into a valuable resource (publications №№ 15, 12, 22, 25, 26 of list 6). The influence of microgravity on cellulose waste degradation processes was investigated. As the research was carried out as part of a project funded by the European Space Agency, not all results have been published. Two of the publications (15 and 12) were **cited a total of 10 times**.

Microbiome of reptiles from the territory of Bulgaria

The microbiome of 5 species of lizards belonging to 3 families was studied, and 24 species of opportunistic bacteria were isolated and identified. Such studies are being conducted for the first time in Bulgaria, given that these reptiles are asymptomatic carriers of various zoonotic pathogens. The susceptibility of the isolates to antibiotics and the production of some enzymes considered as virulence factors were evaluated. The most common bacterial species were identified. Based on the obtained results, it was concluded that most isolates are a relatively low risk to human health, due to the limited production of enzymes that could play a role in pathogenesis, as well as due to their sensitivity to antibiotics (papers №№ 19, 20, 28, 29 of list 6). All articles in this scientific direction were published in 2024 (articles №№ 19 and 20 in Q2 journals, and the other two in a journal refereed and indexed in Scopus without SJR/IF), which is why no citations have been noticed yet.

3.2. Evaluation of project activity

Dr. Gocheva has participated in 5 research projects as follows: 3 participations in national projects funded by the Bulgarian National Science Fund at the Ministry of Education and Science, 1 participation in an international scientific project funded by the European Space Agency, 1 participation in a research project funded by the Scientific Research Fund of Institute of Microbiology. In addition to the above, Dr. Gocheva has two personal participations in projects external to the Institute of Microbiology and financed by the Bulgarian National Science Fund at the Ministry of Education and Science and realized 1 grant funded by the Erasmus+ program. The first 5 project participations are thematically closely related to the scientific area of her research activity and correspond to the specialty of the current competition for the position "associate professor".

3.3. Evaluation of scientific contributions

From the scientific studies in which Dr. Gocheva participated, results were obtained that have a contributing character with scientific and scientific-applied significance.

I would define the following contributions in the respective scientific directions of her research activity as follows:

Study of temperature and oxidative stress in filamentous fungi isolated from Antarctica and the role of the enzymes catalase and oxide dismutase

1. Biodiversity of Antarctic filamentous fungi was studied and the genera with the most species were identified. Given the ability of these microorganisms to produce a variety of biologically active substances and the insufficient study of the habitat from which they are isolated, the creation of a collection of Antarctic strains is a contribution of scientific and scientific-applied importance and an important base for ongoing scientific research.
2. New knowledge was obtained about the mechanisms of adaptation of filamentous fungi to low temperature stress and their potential as producers of enzymes with unique characteristics, which is a contribution of a scientific and scientific-applied nature.
3. For the first time, the role of the Pac2 protein and the reasons for the formation of misfolded proteins under stress conditions were established in model yeast strains under stress conditions. The obtained results are new scientific information with important theoretical significance.

Studies on lactic acid bacteria and their antibacterial activities

4. Complementary results were obtained for the metabolic activities of lactic acid bacteria and their specific aroma-forming characteristics, as a prerequisite for their use in functional foods, which I define as a contribution of scientific and applied importance.

Studies on new enzymes and their potential applications from various bacterial and fungal producers

5. A new recombinant malate quinone oxidoreductase enzyme with application in the creation of biosensors for monitoring and fermentation control in wine production was constructed, expressed, purified and characterized, which is a contribution of scientific and scientific-applied importance.
6. The synthesis of the enzyme sialidase from the non-pathogenic saprophyte *Oerskovia paurometabola* 129 was demonstrated for the first time. A laboratory protocol was developed by which the enzyme was purified and then characterized. The results are a scientific and scientific-applied contribution.
7. The inhibitory effect of *Rosa damascena* and *Origanum vulgare* ssp. *hirtum* extracts and natural compounds on bacterial sialidases obtained from *Vibrio cholerae* non-O1, *Arthrobacter nicotianae* and *Oerskovia paurometabola* was investigated for the first time. The findings reveal the potential of these natural products as sialidase inhibitors, given the role of these enzymes in the pathogenesis of a number of diseases, and represent a scientific and applied-scientific contribution.
8. A contribution of scientific importance is the obtained new information about the distribution of the sialidase enzyme in the previously unexplored taxonomic group of filamentous fungi. For the first time, the effect of catabolite repression and the mechanisms of regulation of enzyme synthesis in this group of microorganisms were studied. For the first time, in a representative of filamentous fungi, it was demonstrated that sialidase activity increases under conditions of oxidative stress.
9. Of scientific and scientific-applied importance is the selection of a promising Antarctic strain P29 of the species *P. griseofulvum* - a producer of sialidase. The cultivation parameters for the production of the enzyme have been optimized and based on a developed protocol it has been purified. The purified enzyme, active at low temperatures, is the only sialidase produced and characterized by Antarctic fungi to date.

Degradation of cellulose waste by microorganisms.

10. Results were obtained for the degradation of cellulose waste and its conversion into a valuable resource in conditions of Earth gravity and microgravity (space station model) by mixed bacterial communities, and for the first time a comparison of the processes under both types of conditions was performed. The results are a contribution of both a scientific and a scientific-applied nature.

Microbiome of reptiles from the territory of Bulgaria

11. For the first time, research was conducted, as a result of which information was obtained about the microbiome of reptiles inhabiting the territory of Bulgaria, which I would define as a contribution of theoretical importance.

4. Evaluation of the candidate's personal contribution

The documentation presented by Dr. Gocheva, together with the attached scientific papers, the analysis of the obtained results, the interpretation and definition of the main scientific and scientific-applied contributions, presented and summarized very concisely and clearly, I would even say a little modestly, show her personal contribution to their experimental development. The scientific papers are collective, which is usual for the professional field of the competition, but the personal contribution of Dr. Gocheva is clearly distinguishable, given her specialization in the defined scientific fields and her position in the author team.

5. Critical remarks, recommendations and questions

I have no critical remarks or recommendations. In some places in the submitted documents, technical inaccuracies have been made in presenting the numerical values of the points from the fulfilment of some of the indicators set out in the requirements for the academic position "associate professor". I must note, however, that these inaccuracies do not change the positive result of the overall fulfilment of the indicators, which significantly exceeds the requirements.

I have the following questions:

1. Given the importance of sialidases, in what direction will the research with the promising producer *P. griseofulvum* strain P29 selected by you be continued, in order to realize its practical application?

2. In relation to your future plans for research on phytases of bacterial origin with application in agriculture, could you explain why you are focusing on bacteria as producers and not on fungi, which, as you have emphasized, also synthesize phytases, given that fungi are the subject of a large part of your research activity to date?

6. Personal impressions

I have personally known Dr. Gocheva for more than 20 years, since the time when she was a full-time doctoral student in the Department of General and Industrial Microbiology at the Faculty of Biology. The impressions I have gained about her are of a person with a flair for research work, independent and proactive. From the documents submitted for participation in the competition, I see that she has gained a lot of experience, expanding the scientific directions in her research work, as well as leadership and organizational experience, which are very valuable in her work. I know her as calm, ethical and collegial.

CONCLUSION

The documents and materials presented by assist. prof. Dr. Gocheva for participation in the competition for the academic position "associate professor" meets all the requirements of the ADASRB and the Regulations on the Conditions and Order for Acquiring Scientific Degrees and for Holding Academic Positions in the BAS and that of the Institute of Microbiology at the BAS.

The candidate in the competition has presented a sufficient number of scientific papers with high scientometric indicators, as well as convincing evidence of her scientific and applied activity, which I assess entirely positively and highly. I believe that Dr. Gocheva fulfills and even significantly exceeds the requirements of the ADASRB and the additional ones of the Institute of Microbiology for the academic position of "associate professor". Her works have a contributing character with scientific and scientific-applied significance. They have been evaluated by the international scientific community through the citations received. All this allows me to confirm my positive assessment, given by me in the analysis of her academic activity and to confidently recommend to the respected scientific jury, formed by order №. I-162/26.11.2024 of the Director of the Institute of Microbiology at the Bulgarian Academy of Sciences and the members of the Scientific Council, to evaluate the candidacy of assist. prof. Dr. Yana Gancheva Gocheva and to vote positively for the holding of the academic position "associate professor" in the area of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.3. Biological Sciences (Microbiology/Enzymology).

15.01. 2025
Sofia

Reviewer:
(Prof. Dr. Penka Moncheva)