R E V I E W

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of the materials submitted for participation in a competition for the academic position "Associate Professor" at the Institute of Microbiology - BAS (IMiKB - BAS) in professional field: 4.3. Biological Sciences (Microbiology), for the needs of the Department of General Microbiology, Extremophilic Bacteria Laboratory. The competition was announced in the State Gazette, issue 29 of 09. 04. 2021.

The only candidate in the announced competition is **Dr. Nadia Stoycheva Radchenkova**, Ch. Assistant Professor in the Laboratory "Extremophilic Bacteria". The submitted documents under the competition meet the requirements of the Law on the Protection of the Rights of Persons with Disabilities and the relevant regulations.

1. Brief biographical data

Dr. Nadia Radchenkova was born on November 19, 1973, she graduated in Information and Management Technologies at UCTM in 1999 and has been working at IMiKB since 1995, initially as a laboratory assistant. The candidate has spent her entire scientific career at IMiKB - BAS (the institute for whose needs the competition has been announced), successively holding the positions of "Specialist" since 1999, "Assistant" - since 2008 and "Chief Assistant" - since 2014. Since 2003, the candidate has been working in one of the most elite laboratories of the institute - "Extremophilic Bacteria", currently part of the Department of General Microbiology. In 2014, the candidate successfully obtained PhD degree.

2. Overview of the submitted materials for the competition

The candidate Dr. Nadia Radchenkova participate in the competition with a total of 23 scientific papers, of which 15 articles in refereed journals with impact factor, 6 in journals without impact factor and two chapters of books. Eight of the 15 publications with impact factor are in journals with quartile Q1 for the respective year, three - in journals with quartile Q2 and four - in journals with quartile Q3. In six of the publications the candidate is a leading author. The presented publications have a total impact factor of 30,732.

3. Fulfillment of the Minimal National Requirements of the Regulations for application of the Law on the Development of the Academic Staff in the Republic of Bulgaria

Regarding the required minimum national requirements for acquiring the academic position of "Associate Professor", the candidate presents materials, distributed by indicators, as follows:

(i) by group of indicators A: by indicator 1 - dissertation for PhD degree - 50 points (as required by indicator A - 50 points);

(ii) by indicator group B: by indicator 4 - two publications in quartile journals Q1 (50 points in total), two publications in quartile journals Q2 (40 points in total) and 6 publications in the "other" category (36 points in total) - a total of 126 points required for indicator B - 100 points;

(iii) by indicator group Г: by indicator 7 - six publications in quartile journals Q1 (150 points in total), one publication in quartile journal Q2 (20 points in total) and 4 publications in quartile journals Q3 (60 points in total) ; on indicator 8 - published two chapters of books - 30 points. In total, according to indicator Г, materials are presented for 260 points with a requirement 220 points;

(iv) by group of indicators Д: by indicator 11 - 320 citations in the SCOPUS database (640 points) and 10 citations in other publications (10 points) - a total of 650 points for required by indicator Д - 60 points;

(v) by group of indicators Е: by indicator 14 - participation in three national research projects - 30 points; by indicator 15 - participation in 6 international research projects - 120 points. In total, according to indicator Е, participations for 150 points are presented without being required points for the respective competition.

After the reference, I believe that the materials presented by Dr. Nadia Radchenkova fully fulfill (by group of indicators A) or overfulfill (by all other groups of indicators) all the minimum required points in the competition for the respective professional field.

4. Fulfillment of the additional requirements of IMiKB - BAS for acquiring the academic position "Associate Professor"

Regarding the additional requirements of IMikB-BAS for acquiring the academic position "Associate Professor", the materials submitted by the candidate can be evaluated as follows:

(i) a total of 23 publications (excluding those included for PhD degree) were submitted in the competition, in 6 of which the candidate was the first author upon request for 20 (excluding those included for PhD degree) and 5 (leading or corresponding), respectively;

(ii) a total of 330 citations are submitted upon request of 100;

(iii) publications with a total IF of 30,732 (for the entire career of the candidate 34,559) were submitted under the competition with a requirement for a total IF of 20;
(iv) the submitted materials are cited as determining h-factor 10 (9 according to SCOPUS) with a requirement for h-factor 5;
(v) evidence of participation in 9 projects is provided upon request to participate in 3.

The reference and the relevant evidence show that the candidate Dr. Nadia Radchenkova submitted to the competition publications, citations and participation in projects exceeding in all respects the requirements of IMIKB-BAS for the acquisition of the academic position "Associate Professor".

5. Thematics of the research activity

The research of Dr. Nadia Radchenkova is in the field of fermentation processes with focus on those carried out in extreme conditions - high salinity, extreme temperature, pH, etc. Accordingly, the objects of research are extremophilic organisms producing various bioactive compounds and macromolecules with applications in many industries - enzymes, polysaccharides and low molecular weight compounds. Due to their growing application in the food, cosmetics and pharmaceutical industries, there is a growing interest in extremophilic organisms and their products, and research related to finding new, highly productive strains synthesizing new biopolymers - for particularly scientifically attractive.

Depending on the type of extreme growth condition, thematically, the research of Dr. Nadia Radchenkova is divided into research on halophilic and research on thermophilic microorganisms, and according to the type of valuable compound produced by them - on research related to the production of enzymes, and studies related to the production of exopolysaccharides (EPS). Another aspect in the scientific problems of the candidate is the study of the biological diversity of specific ecological niches - salt pans, hot springs, etc.

In the first thematic area, the researches of organisms isolated from the Pomorie and Burgas salt pans are impressive. The impressive biodiversity of the largest Pomorie Lake has been proven by isolating and identifying representatives of 15 bacterial and 15 archael genera, and halotolerant strains of 8 bacterial genera have been isolated from the salt pans in the Burgas Bay. Among them - strains having xanthan lyase, gelan lyase, arabinase and phytase activity, not found so far among halophilic bacteria. Halophile, an overproducer of EPS - identified as *Chromohalobacter canadensis* strain 28 - was also isolated. The conditions for obtaining EPS were optimized, and the aeration regime was indicated as the factor with the most significant impact on the process. In another study with strain 28, the components of the synthesized exopolymers

were identified, among which a high content (75.7% of the protein fraction) of polyglutamic acid was detected - not yet found in a polymer synthesized by a halophilic bacterium.

In the second thematic area, the hot springs in Levunovo and Vetren Dol were used as a source of thermophiles. The bacterial and archaeological diversity of both sources was studied, and it was found that in Levunovo (82 degrees) greater archaeological diversity was observed, and in Vetren Dol (68 degrees) - greater bacterial diversity. Branch libraries from both locations were compiled and analyzed, and most of the sequences made showed similarities below 97% with those known so far.

Three thermophilic EPP overproduces identified as belonging to different genera - *Geobacillus tepidamans* V264, *Aeribacillus pallidus* 418 and *Brevibacillus thermoruber* 423 - have been identified as suitable for testing. The synthesis of EPS from the three strains has been studied in numerous publications. Strain 423 was studied in collaboration with a Turkish team, sequencing its complete genome and determining the optimal conditions for obtaining EPS. The physicochemical properties of EPS synthesized by *A. pallidus* 418 give grounds for its use as an ingredient in cosmetic creams. From another thermophile, the bacterium *Bacillus stearothermophilus* MC7, is isolated and purified in high yield extracellular, thermostable lipase with the potential for multifaceted use.

6. Major scientific contributions

As the main scientific contributions in the scientific production of the candidate I can define the following achievements:

1. The creation of a collection of extremophilic (thermophilic and halophilic) EPS producers,
2. Determining the bacterial and archaeological diversity of specific Bulgarian ecological niches - salt pans and hot springs,
3. Detection of xanthan lyase, gelan lyase, arabinase and phytase activity in halophilic bacteria,
4. Isolation of the world's first known producer of *Aeribacillus,*
5. Optimization of the aeration regime for maximum synthesis of biopolymer by thermophiles,
6. Isolation and characterization of the first member of the genus *Chromohalobacter* capable of synthesizing an exopolymer containing γ-polyglutamic acid,
7. The optimization of a continuous process for the production of an exopolymer with multifaceted application,
8. Isolation and purification of thermostable lipase from *B. stearothermphilus* MC 7.

7. CONCLUSION

In conclusion, the documents and materials submitted by Ch. Assistant Professor Dr. Nadia Radchenkova fully meet all the requirements of the Law for the Development of the Academic Staff in the Republic of Bulgaria position "Associate Professor".

In the works of the candidate there are original scientific and scientific-applied contributions, which have received international recognition, and a representative part of them are published in renowned scientific journals and published by prestigious international publishers. The assessment of presented by Ch. Assistant Professor Dr. Nadia Radchenkova materials exceeds both the minimum national requirements for the position of "Associate Professor", laid down in the regulations for application of ZRASRB and PPZRASRB of BAS, and the specific requirements of IMIKB-BAS for holding the position. Therefore, I give my positive assessment and I strongly recommend to the Scientific Council of IMIKB-BAS to award Ch. Assistant Professor Dr. Nadia Stoycheva Radchenkova the academic position "Associate Professor" in the professional field 4.3. Biological sciences.

August 15, 2021. Reviewer:

(Prof. Kaloyan Kirilov Petrov)