REVIEW

on the materials for participation in a competition for the academic position of "Associate Professor", field of higher education 4. Natural sciences, mathematics and informatics, Professional field 4.4. Earth sciences, scientific specialty "Ecology and protection of ecosystems", in the discipline "Microbiology", announced by the University of Forestry in SG no. 27 / 02.04.2021, procedure code: FOR-AsP-0321-54.

Candidates for participation in the competition are:

1. **Chief Assist. Prof. PhD Boyka Zdravkova Malcheva**

Reviewer: Assoc. Prof. Dr. Adriana Gousterova, PhD in Professional field 4.3. „Biological sciences", from Bulgarian Academy of Sciences (BAS) – Institute of Microbiology, Sofia City

1. Brief biographical data about the candidate

Chief Assist. Prof. PhD Boyka Zdravkova Malcheva was born on 20.03.1980 in the town Sandanski. She graduated at the specialized high school Yane Sandanski in the town of Sandanski with an extended study of biology. During the period 1999 - 2003 she was a student at the University of Forestry (UF), Bachelor's degree, majoring in "Ecology and Environmental Protection". She graduated with a Master's degree with a qualification of Settlement Ecology in 2005. In 2002-2004 she acquired a professional qualification of Teacher in General Technical and Special Subjects. She defended her doctoral dissertation in 2012 with the topic: "Soil-microbiological indicators for establishing the status of anthropogenic soils on the territory of municipality of Sofia." Since 2012 she has been successively assistant professor and senior assistant professor.

In parallel with the training for educational and scientific degree "Doctor" and teaching as an assistant professor from 2010 to 2018, the candidate works in the Sofia Regional Health Inspectorate consecutively as a junior, senior and chief expert - ecologist in the department "Physico-chemical research of the living environment", where she participates in an accredited Body for control of environmental factors and products of importance for the health of the population. She studies, validates, verifies and applies methods in the field of sanitary chemistry and microbiology.

From the presented professional CV it is evident that Chief Assist. Prof. PhD Boyka Malcheva has improved her professional qualification by participating in specialized courses, was a member of the working team of scientific and educational projects, has good computer literacy (holds a certificate of computer operator), good knowledge in the field of biostatistics (graduates specialization in biostatistics). She speaks English, French and Russian at a good level. Member of the Management Board of the non-governmental organization "Continuing Education" - a branch of the Japanese organization "Nomura - Integrated Lifelong Learning".

Since 2012 she has been a member of the scientific staff of the Department of Soil Science, Faculty of Forestry at the UF. She teaches the disciplines "Microbiology", "Microbiological control in the environment" and "Soil microbiology".

2. **Conformity of the submitted documents and materials of the candidate with the required ones according to the Regulations for Development of the academic staff in the University of Forestry**

The candidate Chief Assist. Prof. PhD Boyka Malcheva has presented a list of titles of all her scientific products - a total of 49 scientific papers, including 1 dissertation, 1 pc. abstract of the dissertation, 1 pc., monograph, 1 pc. book, 4 pcs. manuals, 29 pcs. publications on reference-self-assessment, 12 pcs. publications outside the reference-self-assessment. The submitted documents comply with the requirements of the Regulations for Development of the academic staff in the University of Forestry. The scientific production of the candidate complies with the minimum national requirements under Art. 2b of the Law for Development of the academic staff in Republic of Bulgaria and art. 2a, para. 1 from the Regulations for Development of the academic staff in the University of Forestry. The applicant covers the minimum required points under professional field 4.4. "Earth Sciences" for the academic position "Associate Professor", by groups of indicators, as by indicator "G" and "D" surpasses them. According to the minimum required points for professional field 4.4. "Earth Sciences", the reference and the assessment of the conformity by indicators is as follows:

Indicator A1 – Dissertation for the award of educational and scientific degree "Doctor". A copy of the diploma for the educational and scientific degree "Doctor" is presented. The required 50 points have been met.

Indicator B3 – Habilitation work - monograph. A monographic work with a volume of 186 pages is presented in the original. The required 100 points have been fulfilled.

Indicator G6 – Published book based on a defended dissertation for the award of educational and scientific degree "Doctor". A book with a volume of 262 pages is presented in the original.

Indicator G7 – Scientific publications in editions that are referenced and indexed in world-famous databases of scientific information. Presented copies of 10 publications.

Indicator G8 – Scientific publications in unreferenced journals with scientific review or in edited collective volumes. Presented copies of 19 publications.

Total for G6+G7+G8 required 200 points – 321,1 points are fulfilled.

Summaries of the scientific production are presented.

Indicator D10 – Citation in scientific journals, referenced and indexed in world-famous databases with scientific information or in monographs and collective volumes - 7 issues.

Indicator D 11 – Cited in monographs and collective volumes with scientific review - 17 issues.

Indicator D 12 – Cited in unreferred journals with scientific review - 3 issues.

Of the required 50 points according to indicator "D", 92 points were fulfilled.

A list of citations is presented, accompanied by copies of parts of the scientific publications in which the citations are established.

Apart from the reference for the minimum required points by group of indicators, for holding the academic position of "associate professor", 6 pcs. scientific publications are presented in a list before acquiring educational and scientific degree (ESD) "Doctor" and 6 pcs. scientific publications after educational and scientific degree "doctor" (specified in a competition for senior assistant professor) - these publications are not reviewed. The same list presents 4 textbooks (3 published on paper, co-authored and 1 stand-alone textbook, in a virtual library), participation with 4 posters at scientific conferences and symposium, and participation in 13 projects (11 scientific and 2 educational).

Copies of the scientific production, official notes for participation in the described projects, management of graduates (2 pcs.), as well as copies of 21 pcs. documents for additional qualification (courses and trainings) are presented.

3. Evaluation of the teaching activity of the candidate

Chief Assist. Prof. PhD Boyka Malcheva gives lectures and exercises in full-time and part-time education of the Bachelor's degree in the discipline "Microbiology" in the specialties: "Ecology and Environmental Protection" (EEP), "Agronomy" and "Plant protection", and in the Master's degree in the discipline "Microbiological control in the environment" of the EEP specialty - master's programs: "Settlement ecology" and "Environmental restoration and ecological monitoring", as well as in the discipline "Soil microbiology" of the specialty Forestry - "Forest Management". She participates in updating the curricula in which she teaches. She was a supervisor of two successfully defended the graduate in 2020. She participated as an expert in the "training module" in the project № BG051PO001-4.3.04-0052 "Development of a center for electronic forms of distance learning at the University of Forestry."

4. Evaluation of the scientific, scientific-applied and publishing activity of the candidate

4.1. Participation in scientific, scientific-applied and educational projects

Chief Assist. Prof. PhD Boyka Malcheva is a member of the research team of 10 finished (2006 - 2018) and 1 current research project. She participates in 4 research projects funded by NIS-UF, 3 by NIS-Sectoral Contracts (UF), 2 by NIA at TU-Varna, 1 by Training-Experimental Forestry-UF and 1 by Executive Forest Agency-Ministry of Agriculture and Foods. She participated as an expert in the preparation of the training module "Soil Microbiology" in 1 educational project and as a specialist in 1 educational project - both co-financed by the EU.

Dr. Boyka Malcheva has taken part in 8 scientific and applied tasks at the "High-Tech Park-Technical University of Varna" in the field of soil microbiology and enzymology.

Relevant documents are presented for the participation in the projects and the scientific-applied tasks.

4.2. Characteristics of the published scientific results

In the reference-self-assessment for compliance of the scientific production with the minimum national requirements Chief Assist. Prof. PhD Boyka Malcheva presents: 1 pc. dissertation for the award of ESD "Doctor", 1 pc. habilitation thesis - monograph, 1 pc. book based on the dissertation, 29 scientific publications, of which 10 in refereed and indexed journals in world-famous databases with scientific information (Web of Science - WoS, Scopus) and 19 in non-refereed journals with scientific review or edited collective volumes. The candidate is the sole author of the presented monograph entitled: "Microbiological activity of soils in an urban ecosystem". The monographic work examines the microbiological activity of roadside urbogenic soils under different vegetation from parts of the roadside landscaping representative of the city of Plovdiv - vegetative buffer green lawns around the transport arteries from all administrative regions of the city. Microbiological indicators were analyzed to clarify the influence of heavy metal pollution on the structure and activity of the soil microbiocenosis in urban environments (B3). The stand-alone publications are 23% (B3, G6, G7.2, G7.4, G8.13, G8.16, G8.19). She is a first author in 29% of the publications (G7.3,

G7.5, G7.6, G7.7, G7.9, G8.1, G8.2, G8.11, G8.14), she is a second author in 13% of the publications (G7.8, G7.10, G8.3, G8.4), in the remaining 35% she is in third and next place (G7.1, G8.5, G8.6, G8.7 , G8.8, G8.9, G8.10, G8.12, G8.15, G8.17, G8.18). 34% of the publications (G7.1 till G7.10) are in referenced and indexed journals in world-famous databases with scientific information (WoS, Scopus), as in 20% of them she is an independent author, and in 50% she is the first author. Two of the publications (G7.1, G7.2) are with impact factor and impact rank, published in journals, referenced and indexed in WoS and Scopus - respectively one (G7.1) co-authored in Catena magazine (IF = 4.333, SJR = 1.389) and one (G7.2) alone in the Journal of Environmental Protection and Ecology (IF = 0.692, SJR = 0.263). Three of the publications are only with impact rank (G7.3, G7.8, G7.10). 66% of the publications (G8.1 to G8.19) are in unreferred journals with scientifically peer-reviewed or edited collective volumes. 22 issues of the articles in the self-assessment report have been published in international scientific journals, 6 of which were presented at scientific forums (international conferences). 21 issues have been published in English and 8 in Bulgarian from the publications presented in the self-assessment report.

The main directions of the scientific works of Chief Assist. Prof. PhD Boyka Malcheva, presented for participation in the competition are:

► Microbiological and enzymatic activity of anthropogenic soils (B3, G6, G7.1, G8.1, G8.2, G8.3, G8.5);

► Microbiological and enzymatic activity of agrogenic soils (G7.5, G7.7, G8.1, G8.4, G8.6, G8.7, G8.11, G8.14);

► Microbiological and enzymatic activity of organic fertilizers (G7.6, G7.9, G8.19);

► Microbiological and enzymatic activity of reclamation substrates (G7.2, G7.4);

► Chemical, microbiological and enzymatic indicators in forest soils (G8.16, G8.17; G8.18);

► Chemical and microbiological control of food additives (G7.8, G7.10);

► Determination of the microbiological status of polar soils (G7.3).

4.3. Reflection of the candidate's scientific activity in the literature (citation)

Chief Assist. Prof. PhD Boyka Malcheva presents a total of 27 citations in the "Self-Assessment". There are 7 citations of 4 publications (D10.1 to D10.4) in referenced and indexed journals in world-famous databases with scientific information, 17 citations of 17 publications in monographs (G11.1 to G11.17) and 3 citations of 3 publications in non-peer-reviewed journals with scientific review (D12.1 to D12.3). Copies of parts of the publications in which the citations are established are presented.

4.4. Contributions in the works of candidates (scientific, scientific-applied, applied)

In general, I accept the scientific and scientific-applied contributions of the candidate, presented in the "Information on the contributions in the works". Here are some of them, grouped in several main areas:

► ***DETERMINATION OF THE MICROBIOLOGICAL AND ENZYME STATUS OF URBOGENIC SOILS AND SOILS WITH HEAVY METAL POLLUTION***

- Establishment of a comprehensive assessment of the microbiological and enzymatic status of anthropogenic soils subjected to different loads from road traffic and industry, mainly of heavy metals (A1, B3, G6, G8.1, G8.13).
- The data from the studies contribute to a more detailed knowledge of urbogenic soils near congested road arteries and industrial sites - original information on the

composition and activity of soil microorganisms in urbogenic soils is obtained (A1, B3, G6, G8.1)

- Own methods for complex reporting of microbiological (ICMA) and enzymatic (ICEA) activity of urbogenic soils are proposed, which can be used for each soil type (A1, B3, G6).
- Specific microbiological and enzymatic indicators are proposed for express determination of the degree of pollution and the biological condition of anthropogenic soils (A1, B3, G6, G8.1, G8.13).
- The microbiological and enzymatic soil activity is evaluated by adding different concentrations of lead and cadmium in a laboratory experiment. Regularities for the influence of the type and concentration of heavy metal on the composition, quantity and enzymatic activity of soil microorganisms are derived (G8.13).
- Establishment of a comparative assessment of the microbiological and enzymatic status of soils from urbocenosis, agrocenosis and technocenosis, mainly affected by heavy metal pollution (G8.1).
- Based on our own data, soil-microbiological maps have been developed, illustrating the relationship between the degree of contamination of soils with heavy metals and the amount of total microflora (A1).

► ***DETERMINATION OF THE MICROBIOLOGICAL AND ENZYME STATUS OF AGROGENIC SOILS***

- The influence of different fertilizer products on chemical, microbiological and biochemical indicators for improving soil fertility and productivity of different crops has been studied (G8.4; G8.6; G8.7; G8.11; G8.14; G8.15 ; G8.19).

► ***DETERMINATION OF THE MICROBIOLOGICAL AND ENZYME STATUS OF ORGANIC FERTILIZERS DURING THEIR DEVELOPMENT AND APPLICATION***

- Organic ameliorants have been created which have been analyzed by chemical, microbiological and biochemical indicators, and their effectiveness has been monitored in agrogenic soils with different agricultural crops (G7.9; G7.7; G7.6; G7.5). The created compost variants and biochar can be used to improve soil fertility and yield from plantations.

► ***DETERMINATION OF THE MICROBIOLOGICAL AND ENZYME STATUS OF RECULTIVATED SOILS***

- A comparative assessment of the humification and development of the soil microcoenosis for a multi-year period was made, using paired data for reclaimed soils on open technological processes for coal extraction (G7.1).
- The microbiological and enzymatic status of regenerated substrates from mine, soil depot and tailings pond in the application of vermiculite and mineral fertilization, in dynamics, before and after the application of ameliorants (G7.2, G7.4), is analyzed.

► ***DETERMINATION OF CHEMICAL, MICROBIOLOGICAL AND ENZYME INDICATORS OF FOREST SOILS***

- The changes in the amount of organic matter as a result of forest fires have been studied. The carbon content of burned forest soils was monitored (G8.17; G8.18).

- Chemical, microbiological and enzymatic indicators have been determined after a long period of mineral fertilization of forest soils, under different vegetation. The development of soil microbial succession in multiannual dynamics was studied (G8.16).

► ***DETERMINATION OF THE MICROBIOLOGICAL STATUS OF POLAR SOILS***

- The studied microbiological indicators of soils from Antarctica can be considered as sensitive indicators for the microbiological status of soils from extreme zones (G7.3).

► ***DETERMINATION OF THE MICROBIOLOGICAL AND ENZYME STATUS OF FLOODED SOILS***

- The studied chemical, microbiological and biochemical indices can serve as indicators of advancing changes in flooded soils and can be used in their subsequent recovery, especially since such studies are very weakly represented (G8.2; G8.3).

► ***DETERMINATION OF THE MICROBIOLOGICAL AND ENZYME STATUS OF SOILS AFFECTED BY WIND GENERATORS***

- The studied microbiological and biochemical indices can serve as indicators of changes in wind erosion of soils and can be used in their subsequent recovery, especially since such studies are very weakly represented (G8.5).

► ***DETERMINATION OF THE SANITARY-MICROBIOLOGICAL CONTROL OF NUTRITIONAL SUPPLEMENTS. VALIDATION AND VERIFICATION OF CHEMICAL AND MICROBIOLOGICAL METHODS***

- A method for quantitative determination of lead and cadmium in tablet forms of food supplements containing extracts of the medicinal plants hawthorn (*Crataegus* sp.) and caltrop (*Tribulus terrestris* L.) has been developed and validated by atomic absorption flame spectrometry (G7.10).

- A method for the total number of microorganisms in tablets containing the medicinal plants hawthorn and caltrop was validated and verified, by analyzing the indicators: repeatability, reproducibility and indefiniteness (G7.8).

► ***THE DEVELOPMENT OF STATISTICAL MODELS FOR DATA PROCESSING - BIOLOGICAL MATRIXES***

- A statistical model has been created, which presents synthesized criteria for assessing the information value of diagnostic features: sampling depth, soil moisture, soil temperature and lead content in relation to the content of total microflora at a depth of 0-15 cm and 15-40 cm (G8.8).

- A mathematical model was created, including regression and correlation analysis for different as volume excerpts from data, analyzing the influence of four main factors on the number of total soil microflora: sampling depth, soil moisture and soil temperature, lead content (G8.9).

- A model for recognition and prediction of soil microbiological activity by indirect characteristics is described, considering four factors that actively influence microbial biogenicity: sampling depth, soil moisture and soil temperature, lead content (G8.10).

5. Assessment of the personal contribution of the candidate

The participation of Chief Assist. Prof. PhD B. Malcheva in the mentioned 31 scientific papers in the reference-self-assessment is as follows: in over 50% of the papers she is the sole or first author (16 pcs.) - 1 independent monograph, 1 book based on a dissertation, 5 independent publications, in 9 publications she is the first author. In 4 of the publications she is the second author and in the other 11 publications she is in the third and next place. In 70% of the publications in peer-reviewed and indexed journals in world-famous databases with scientific information she is the first or only author. In two of the mentioned textbooks she is the first author, in one she is a second author and one is independent. In the presented 4 posters the candidate is the first author of two of them. The personal contribution of the candidate in the presented scientific papers is indicative, especially in the field of soil microbiology and enzymology. A larger number of publications are related to results obtained from microbiological and enzymatic studies of anthropogenic soils. Dr. Boyka Malcheva also participates in 11 scientific projects and 8 scientific and applied tasks as a member of the working team and in 2 educational projects - as an expert in developing a training module "Soil Microbiology" and as a trainee.

It can be concluded that the personal contribution of the candidate in the considered scientific activity is quite well expressed.

6. Critical remarks and recommendations

I have no critical remarks, but I allow myself to make a recommendation - in the future, to focus her publishing activity on magazines with an impact factor and to undertake a training of PhD student.

7. Personal impressions

I know Chief Assist. Prof. PhD Boyka Malcheva during her doctoral studies with Prof. Nustorova.

She was distinguished by great diligence, responsibility for the work, precise and having a serious attitude to the implementation of the assigned tasks. My impressions are that she is a very good teacher, develops and enriches her teaching style, updates the teaching material with modern information.

In summarizing the results and their interpretation, she is creative.

8. Conclusion

In terms of volume, content and quality, the presented scientific production and the active research and organizational activity, professional and scientific experience of the candidate fully comply with the requirements for holding the academic position of "Associate Professor". **I confidently give my positive assessment and I PROPOSE the candidate CHIEF ASSIST. PROF. PhD BOYKA ZDRAVKOVA MALCHEVA to take the academic position of "Associate Professor" in the discipline "Microbiology" from Professional field 4.4. Earth sciences.**

Reviewer's signature: 

Review submitted to: 2.8.2021 г.