

## Review

by: prof. Iskra Vitanova Ivanova

member of the scientific jury according to the decision of the Rector of Sofia University "St. Kliment Ohridski" № ПД-38-566/03.12.2020 for the competition for the academic position of "Associate Professor" in the field of higher education 4 "Natural Sciences, Mathematics, Informatics"; professional field 4.3. Biological Sciences; scientific specialty "(Ecology and protection of ecosystems - Ecology of microorganisms), published in SG no. 88 of 13/10/2020

Only one candidate participates in the competition for "Associate Professor": Ch. assistant Dr. Silvena Boteva Boteva

### **Brief biographical reference and assessment of the publishing activity**

Assistant Dr. Silvena Boteva was born on March 10, 1982. He graduated with honors from the Sofia University (Sofia University) "St. Kliment Ohridski" (bachelor and master), and in 2006 acquired a professional qualification master of environmental protection. donor in (SU) "St. Kliment Ohridski" to the position of chief assistant from 2014 to the present. In 2006-2009 he was a full-time doctoral student and successfully defended his dissertation for ONS "Doctor" on "Structure and functions of bacterioplankton from the circus of the Seven Rila Lakes-Rila National Park" The work experience of the candidate in the specialty with his doctoral education exceeds 11 years and he has acquired the following positions - as an expert ecologist (2010-2014) in the Research Sector at the Technical University, full-time doctoral student (2006-2009), lecturer in (Sofia University) "St. Kliment Ohridski" as Chief Assistant from 2014 to the present.

### **General description of the submitted materials in the competition.**

The scientific works of assistant prof. Silvena Boteva can be distributed in accordance with the Law on the Development of Academic Staff in the Republic of Bulgaria, the Regulations thereto, as well as the Regulations on the terms and conditions for obtaining degrees and holding academic positions in Sofia University. For participation in the competition for the academic position of "Associate Professor" in the scientific specialty "(Ecology and protection of ecosystems - Ecology of microorganisms), a total of 19 scientific papers and chapters in two books were presented, which were not used in the procedures for obtaining the educational and scientific degree "Doctor" and for the academic position "Chief Assistant".

The documents and materials submitted by assistant prof. Silvena Boteva, meet all the requirements of ZRASRB, the Regulations for application of ZRASRB.

Criteria "A" - an abstract of a dissertation for awarding the educational and scientific degree "Doctor" - 50 points

Criteria "B" - 5 articles are presented (equivalent to a monographic work), which do not repeat the ones presented for acquiring the educational and scientific degree "Doctor", and for holding the academic position "Chief Assistant" (110 points). All of them are in specialized journals with impact factor, referenced and indexed in world databases and fall into category Q1 and Q2.

Criteria "D" includes 14 publications in publications that are referenced and indexed in world-famous databases of scientific information (Web of Science and Scopus), which are in categories Q1 - Q4 (219 points).

Criteria "E" includes 99 citations in scientific journals, monographs, collective volumes and patents, referenced and indexed in world-famous databases of scientific information (Web of Science and Scopus) (198 points) and 66 citations in books, journals etc. (total points 294)

The presented materials show that Dr. Silvena Boteva participates in conferences with reports and / or posters: from 2012 to 2020 - a total of 36, of which 25 international, she is a leading author in 10 of the publications, H index 4. She is a supervisor of 14 successfully defended graduates from 2014 to

2020 (3 from the Faculty of Biology of Sofia University and 8 from the Technical University. He participates in scientific and educational projects.

**The contributions of the submitted materials for participation in the competition for the academic position "Associate Professor" in the scientific specialty "Ecology and protection of ecosystems - Ecology of microorganisms, can be grouped in several areas:**

**I. *Impact of pollutants on soil microbial communities - presents the scope of the main articles included in the habilitation work.***

1. Azoxystrobin fungicide impact on soil microbial communities

*Articles: B4-1, B4-2, Г7-5*

Obtained results enrich the available information on the azoxystrobin effects on soil microorganisms. These effects range from antibiotic sensitivity (streptomycin in clay-loamy and gentamicin in loamy-sand soil) to antibiotic resistance (streptomycin and kanamycin in loamy-sand and gentamicin in clay-loamy soil; ampicillin and chloramphenicol in loamy-sand and clay-loamy soil, and no effect was observed to tetracycline (loamy-sand and clay-loamy soil) and streptomycin (clay-loamy soil). Azoxystrobin stimulated the development of bacterial antibiotic resistance in soils even at the lowest (manufacturer's recommended) applied dose of the fungicide, as the main factors modeling antibiotic resistance of bacterial communities were soil type, azoxystrobin dose and exposure time. The plasticity of the soil enzyme activities showed that four months after soil treatment (day 120 of the experiment) with azoxystrobin, the enzyme activity was still not restored, and in addition it was far from its stable natural state (condition before amendment with the fungicide).

2. Effects of radionuclides and heavy metals on soil microbial communities

*Articles: B4-3, B4-4, B4-5, Г7-3, Г8-2*

There have been obtained evidences regarding the key role of soil organic matter in maintaining high microbial enzyme activities and mitigating metal toxicity. Results showed that long-term and relatively low soil pollution has selected functionally well-adapted to the local environment microbial communities, which allows them to mediate the provision of vital ecosystem services such as participation in biochemical cycles, maintaining plant health and productivity and regulation of carbon sequestration. As a result of summarizing literature data, it was found that changes in the physiological profile and induced tolerance of microbial communities can be used as indicators of heavy metals impact, and subsequently for assessment of soil quality and environmental risk assessment.

3. Impact of oil pollution on microbial communities

*Articles: Г7-11, Г7.0-3*

It has been established the ability of microorganisms in alluvial soils (clayey and sandy) to decompose crude oil, as the process intensity depended on the specific oil density, but did not depend on the soil structure. A relationship between heterotrophic bacteria (number and metabolic activity) was established, which was determined by the season, but not by the local conditions, while number of oil-decomposing bacteria showed dependence on both the season and the wetlands conditions, which were analyzed.

4. Impact of methane on soil microbial communities

*Articles: Г7-10*

It has been proved the ability of a methanotrophic bacterial strain isolated from a municipal landfill to oxidize methane at a wide range of concentrations and temperatures, making it a potential agent for bioremediation of landfills in order to reduce methane emissions.

**II. *Bacterioplankton of high mountain lakes***

*Articles: Г7-14*

For the first time, it was determined the number of bacterioplankton from Bubreka and Okoto lakes (Seven Rila Lakes circus. Molecular methods (ARDRA) were applied for determining its diversity, as

a result of which three clone libraries were constructed for Lake Okoto and bacterial diversity dynamics in temporal and seasonal aspects were identified.

### ***III. Contributions in the field of ecotoxicology***

*Articles: Γ7-8, Γ7.0-1, Γ7.0-2, Γ8-1*

By applying standard ecotoxicological tests in combination with molecular analyses (PCR), the effects of the herbicides paraquat and glyphosate were studied, and it was registered higher toxicity of paraquat by all studied indicators as well as mutational rearrangements in the DNA of the herbicide-treated plants. Standard test-objects were applied for additional soil monitoring analysis, and for testing of treated wastewater from metal industry, which allowed to supplement the data from the monitoring studies with information about the functional capacity of the soil and the impact of treated wastewater on aquatic organisms. As a result of a review of ecotoxicological research for the period 2010-2016, the main trends in the ecotoxicology development for the period and the use of new indicators for risk assessing and ecosystems condition were identified.

### ***IV. Application of remote sensing methods in ecology***

*Articles: Γ7-2, Γ7-4, Γ7-7, Γ7-12, Γ7-13*

There were analyzed new applications of the remote sensing methods for determining classes of land cover and land use, studying the relationship between land cover and the processes of land formation, identification of erosion processes, determining the combined influence of environmental factors and human impact on the distribution of vegetation, assessing the risk of fires by using models with plant species.

### ***V. Contributions with practical importance in the field of environmental protection***

*Articles: Γ7-6*

By assessing the energy efficiency of four greenhouse crops grown on the island of Crete, Greece, based on energy inputs and outputs, obtained data were of practical importance, as they have served to distinguish farmers into efficient and inefficient, both by environmental impact and financial costs.

*Articles: Γ7-9*

An innovative non-woven adsorbent has been developed for cleaning up oil spills, which is efficient (successfully adsorbs and retains oil), economical (produced from waste fibers from the textile industry) and environmentally friendly (the used material can serve as a fuel in furnaces).

*Articles: Γ7-1*

By conducting analysis of the Common Agricultural Policy implementation in the Southwestern planning region (Republic of Bulgaria), it was found that Blagoevgrad district, unlike the national observed trend, creates conditions for a relatively high level of extensive livestock, which allows protection and maintenance of pastures and meadows, with all their consequences and improvement of the provided ecosystem services.

### **Teaching activity**

As a chief assistant in the Department of Ecology and Environmental Protection she conducts practical classes (exercises and field practice) in the discipline Ecology and Environmental Protection (by topics: Microbocenosis, Bioindication of polluted air, Bioindication of polluted soils, Allelopathy) in the specialties Biology, Biology and Chemistry, Biology and Geography, Ecology, Biomanagement and Sustainable Development, Molecular Biology, Biotechnology - all from the Faculty of Biology, and majoring in Ecology from the Faculty of Chemistry and Pharmacy. Silvena Boteva also teaches practical classes in the course Waste Management in Ecology and Biomanagement and Sustainable Development (bachelors); in the course Soil Science for specialty Ecology and Environmental Protection and in the course Ecological monitoring for specialty Ecology and

environmental protection. He also gives practical exercises in the discipline Ecology of microorganisms in the master's program Ecology.

Silvena Boteva has developed and conducts lecture courses together with exercises for them in the following disciplines: Soil Science, which is mandatory for the specialty of Agrobiotechnology. Environmental Impact Assessment, which are mandatory for the specialty Biomangement and Sustainable Development and eligible for a master's program. Ecological footprint is optional for various courses. Dr. Boteva teaches Mapping and Evaluation of Ecosystem Services, which is an elective course for the master's program Ecology, as they were developed jointly with a colleague from the Department of Ecology and Environmental Protection.

### **Critical notes and recommendations**

I have no critical remarks to the materials presented by assistant prof. Silvena Boteva. They correspond to the theme of the competition, both in volume and quality. In addition, the documentation is designed precisely and allows to get a complete picture of all areas of the applicant's activity. Summarizing all the above I can summarize that my assessment of the research and teaching activities of Ch. assistant Silvena Boteva is emphatically positive.

### **Conclusion**

The documents and materials submitted by assistant prof. Silvena Boteva, meet all the requirements of ZRASRB, the Regulations for application of ZRASRB and the relevant Rules of the Sofia University "st. Kliment Ohridski. From the analysis it is clear that ch. assistant professor Silvena Boteva participated in the competition with scientific production, which in terms of scientometric indicators exceeds the requirements for the academic position of "Associate Professor": publications in journals with high IF (falling into categories Q1 and Q2) and citations in renowned international journals. To these must be added the educational activity: defended graduates, teaching activities, as well as participation in projects. I strongly recommend to the members of the esteemed scientific jury, to elect ch. assistant professor SILVENA BOTEVA BOTEVA as a "ASSOCIATE PROFESSOR" in the professional field 4. Natural Sciences, Mathematics and Informatics, 4.3. Biological sciences, scientific specialty"(Ecology and protection of ecosystems - Ecology of microorganisms),

Sofia, 02.02.2021

Reviewer: prof. Iskra Ivanova