PEER REVIEW

of the documents submitted for participation in the competition for the academic position "Professor" in professional field 4.3. Biological sciences, scientific specialty "Botany" (Vascular Plants) for the needs of the Faculty of Biology, Sofia University "St. Kliment Ohridski"

Applicant: Assoc. Prof., PhD Dolya Kalcheva Pavlova-Tonkova

Reviewer: Prof., PhD Svetlana Temelkova Bancheva, Institute of Biodiversity and Ecosystem Research – BAS

In the announced competition for the occupation of the academic position "Associate Professor" in professional field 4.3. Biological sciences, scientific specialty "Botany" (Vascular Plants) for the needs of the Faculty of Biology, Sofia University "St. Kliment Ohridski" one candidate participated – Dr. Dolya Kalcheva Pavlova-Tonkova, Assoc. Prof. in the Department of Botany of the same faculty. I have no joint publications with the applicant, submitted for participation in the competition. The documents presented by Dr. Pavlova-Tonkova show that the procedure for its announcement is in order and they are in accordance with the requirements of the Law for the development of the academic staff in the Republic of Bulgaria and the Rules for its implementation, the Rules for the Structure and Activity of Sofia University, and the Rules on the Terms and Conditions for acquisition of Academic degrees and occupation of Academic positions at Sofia University "St. Kliment Ohridski".

1. General data on the career and thematic development of the applicant

Dolya Kalcheva Pavlova-Tonkova completed her secondary education in 1977 at the High School of Mathematics "G. Milev" in Pleven, and two years later she graduated from the Teacher Training Institute "L. Stanev" in the same city. In 1984 she obtained a Master's Degree in Biology, specialization "Botany" from the Sofia University "St. Kliment Ohridski", Faculty of Biology. In the period 1984-1988 she developed a PhD thesis on the topic "Biosystematic study of the genus *Astragalus* in Bulgaria" in the professional field 4.3. Biological sciences. In 1989 she was appointed as a Senior Assistant and in 1997 as a Principal Assistant in the Department of Botany of the same Faculty. Her academic career continued with habilitation in 2002, when, after a successful competition, she was appointed Associate Professor, a position she still holds. The main responsibilities of Dr. Pavlova-Tonkova are: conducting lectures and exercises on Systematic of Vascular Plants, Botany III,

Taxonomy and Evolution of Vascular Plants, Vascular Flora of Bulgaria, Pre-diploma Workshop, Training Practices. Her scientific interests are in the field of vascular plants - taxonomy, floristic studies, serpentinite ecology, biosystematics - karyology, pollen morphology, etc.

1. Teaching activities

Assoc. Prof. Pavlova-Tonkova has a very serious teaching activity related to lecturing, conducting exercises and participating in teaching field practices, both with students from the Bachelor's degree and those with a Master's degree. Her average total academic workload over the last 5 years is 413.6 hours per year, and the auditorium employment - 297 hours. This indicates the fulfillment of the provisions of the Rules of the Sofia University " St. Kliment Ohridski"workload for teachers of 270 hours of auditorium employment and 360 hours of total academic employment. As a lecturer, she is the author of three lecture courses and one Bachelor's Degree and two Master's Degree courses. She also conducts two Bachelor's Degree courses and two Bachelor's Degrees, as well as in 7 different Bachelor's and 4 Master's Degree exercises.

As a part-time lecturer, the colleague has participated in the training of students from the professional field "Health Care" in the specialty "Assistant Pharmacist" at the Medical University - Pleven, as well as at the Medical College from the academic year 2010/11 to the present time in the discipline "Pharmaceutical botanist". For two consecutive academic years (2017/18 and 2018/19) she taught Masters in Pharmacy at the Medical University – Pleven and is also the author of the curricula in the field of Pharmaceutical Botany at the same university.

As a lecturer at the Faculty of Biology at Sofia University "St. Cl. Ohridski", Assoc. Prof. Pavlova-Tonkova has participated in the training of students in the ERASMUS + program with foreign language teaching. Within the same program, she participated in the training of Master's students at the Agrarian University of Tirana, Albania for three consecutive academic years.

The lectures and exercises she conducts are extremely important for the formation of basic and specialized knowledge of students in the field of pollen morphology, karyology, variability of plant populations under the influence of serpentinite scale, germination of plant seeds, nickel hyperaccumulators, etc. The management of eleven graduates shows her serious commitments to the Masters in the Department of Botany. She also participated in the

scientific management of a doctoral student at the Institute of Forestry at the Bulgarian Academy of Sciences. The management of eleven graduates shows her serious commitments to the Masters in the Department of Botany. She also participated in the scientific management of a PhD student at the Institute of Forestry at the Bulgarian Academy of Sciences.

2. Scientific-metric indicators

The total number of publications of Assoc. Prof. Pavlova-Tonkova during her entire scientific career is 107. In this competition she participates with 54 scientific works, which according to the national requirements are divided into 2 groups: by indicator B – 15 (Q1 - 1, Q2 - 4, Q3 – 3, Q4 – 2, without Q - 5); by indicator G – 23 (Q1 - 4, Q2 - 4, Q3 - 3, Q4 - 0, without Q - 8, book chapter - 1) /these Q are according to the SJR metric of scientific publications/. Assoc. Prof. Pavlova-Tonkova is a co-author of 3 textbooks and 5 textbooks with exercises. The scientific publications with which she participated in the competition were cited a total of 231 times, 75 of which are in journals, referenced by SCOPUS and WEB of SCIENCE. The enclosed applicant's report shows that she fully covers, and by most indicators exceeds the national minimum requirements for the position of Professor.

3. Major areas of the applicant's research and major scientific contributions

In the last twenty years, the scientific interests of Assoc. Prof. Pavlova-Tonkova have focused on the study of serpentinite flora, mainly in the Eastern and Middle Rhodopes, a very interesting and specific flora from territories with ultramafic rocks (with> 70% ferromagnetic minerals). The colleague conducts research focused of fundamental and applied nature, alone or with other colleagues from Bulgaria, Albania, Spain, France and New Zealand. The topic is very interesting and up-to-date, given that the serpentinite flora is composed of species resistant to high metal content, some of which have adapted to accumulate extremely high concentrations of toxic elements (so-called ‘hyperaccumulators’). In many countries, these plants are being used in modern technologies for soil cleaning (phytoremediation) as well as for metal extraction through plants (phyto-mining). The most important centers of this type of flora are the Mediterranean region and the tropical regions of Brazil, Cuba, New Caledonia and Southeast Asia. Serpentinites are also a model system for the study of species formation, since they create conditions for reproductive and geographical isolation. In addition, the serpentinite rock favors the formation and development of endemic and relict flora.

The contributions of Assoc. Prof. Pavlova-Tonkova in relation to the competition are related to the distribution, genesis and specific features of species growing under extreme edaphic conditions and can be attributed to the following main directions:

- Floristics

In a series of several publications, the serpentinite sites with the largest areas in the Rhodope Mts. have been localized, an analysis of the flora has been made, and its taxonomic structure has been clarified. In the Eastern Rhodopes 440 species, subspecies and varieties of 229 genera belonging to 59 families were found, while in the Middle Rhodopes their number is 176. Despite the large difference in the number of taxa found in the two parts of the mountain, the taxonomic structure is similar in relation to the richest species and genera - Poaceae, Asteraceae, Fabaceae, Lamiaceae, Caryophyllaceae, Brassicaceae and others. The biological spectrum and phytogeographical features of the serpentinite flora in the Rhodopes are also clarified. Conclusions have been made about the age of serpentinite flora and the intensity of the formation processes: unlike the serpentinite flora of Albania, Serbia, Greece, Bosnia and Herzegovina, the species formation processes in Bulgaria are much younger and no specific flora complexes are formed yet. The number of endemics and species of conservation importance in the studied serpentine territories in the Rhodopes has also been determined.

As a result of the floristic studies, three new species of vascular plants have been identified and described:*Aethionema rhodopaeum* D. Pavlova [Brassicaceae], *Silene fetlerii* D. Pavlova [Caryophyllaceae] and *Onosma pavlovae* (D. Pavlova) Tan & Petrova [Boraginaceae]. The latter species was originally described by Pavlova-Tonkova as *Onosma bulgarica* D. Pavlova, but due to the fact that it is a later homonym of *O. bulgaricum* Velen. it has to be legitimately published by Kit Tan & Petrova, who give it the name *O. pavlovae,* in honor of its discoverer - Assoc. Prof. Pavlova. The establishment of these species is evidence of the shaping role of serpentines in our country.

In two publications, new horological information was presented, with 34 new taxa established in the Eastern Rhodopes and 1 in the Middle Rhodopes.

Local indicator species have been established for the first time for serpentinite sites in Bulgaria, Greece and Italy, such as *Asplenium cuneifolium* Viv., *Cheilanthes marantae* (L.) Domin, *Convolvulus boissieri* Stend. subsp. *parnassicus* (Boiss. & Orph.) Kuzm., *Thymus bracteosus* Vis. ex Benth.

In three publications, the taxonomic structure of the Bulgarian serpentine flora from the Eastern Rhodopes was compared with the flora of serpentines from the Vourinus Mountains in northwestern Greece, proving the similarities and specifics between the compared flora.

For the first time, the endemic species *Anthemis rumelica* was investigated. Two flavonoids and 4 sesquiterpene lactones have been isolated and structurally characterized, two of which are newly discovered natural compounds with a guyanine carbon skeleton.

One publication deals with the analysis of anthropogenic influence on the natural serpentine flora and the distribution of ruderal species. The pioneering role of taxa such as *Juniperus communis* L., *J. oxycedrus* L., *Rubus*, *Rosa*, *Prunus*, *Crataegus*, *Pyrus*, *Cistus*, *Festuca*, *Dischantium*, *Koeleria*, *Chrysopogon*, *Poa*, etc. in the restoration of native serpentinite vegetation has been demonstrated.

- Biologo-ecological investigations

A karyological study of serpentinite plants in the Rhodope Mountains was conducted. For the first time the chromosomal numbers of newly described local endemites and serpentinophytes [*Aethionema rhodopaeum* D. Pavlova (2n=24) и *Silene fetlerii* D. Pavlova (2n=24)] were established; in addition, for the first time from the Bulgarian flora the chromosomal numbers of following taxa were detected: *Thlaspi apterum* Velen., *Arenaria procera* Spreng. subsp. *procera*; *Silene fabarioides* Hausskn., *Thlaspi ochroleuicum* Boiss. & Heldr. The analysis revealed that plant species respond to different edaphic conditions, most often remaining conservative in their chromosomal numbers and altering karyotype morphology through chromosomal rearrangements.

For the first time, the morphological variability in populations of *Teucrium chamaedrys* L. and *T. polium* L. growing on serpentinite compared with non-serpentinite ones was analyzed. The serpentinite populations of *T. chamaedrys*

clearly distinguishe from its non-serpentine populations, whereas in *T. pollium* agg. such a distinction is not possible.

In studies conducted by the applicant, for the first time in Bulgarian serpentinitna flora, plants hyperaccumulators of Ni were established (e.g. *Alyssum murale* Waldst. & Kit. subsp. *murale*, *A. murale* subsp. *pichleri* (Velen.) Stoj. & Stef.; *Thlaspi praecox* Wulfen in Jacq., *Th. apterum* Velen., *Th. ochroleucum* Boiss. & Heldr.). The data obtained confirm the ability of the species to extract metals from the soil at concentrations significantly higher than the limit values of 10 ppm. Metal-tolerant species of the genus *Alyssum* and the genus *Thlaspi* are plants with good soil stabilization capabilities and can be used to extract metals from soil with rich content (phyto-mining) or for rehabilitation of post-mining sites where the plant is usually the cover is scarce. These candidate publications are the most cited.

The endemic species *Alyssum markgrafii* and some populations of *A. murale* have been found to exhibit the best nickel extraction from the soil and the highest biomass production.

Bulgarian populations of medicinal plants, growing on serpentinite, have been analyzed for metal content for the first time, as well as their ability to tolerate or accumulate these metals. It was found that: (a) the metal concentrations in the aboveground parts of the plants react differently to the metal content of the soil; (b) the total amount of metals varies between populations of the same species and also shows species specificity; (c) the excess content of the metals is in line with the excess content of the plant substances; d) there is a different content of metals in each serpentine site; (e) strict control of the origin of the plant substances is required prior to their medical application.

It is worth noting that the colleague uses appropriate methods that allow her to obtain reliable results. The analytical part in the review submitted for publication is thorough and comprehensive. I accept the report for the scientific contributions of Assoc. Prof. Pavlova-Tonkova and find it objective and accurately reflecting her research.

4. Evidence of the significance of the studies conducted

Assoc. Prof. Dolya Pavlova-Tonkova presented a list of 231 citations of works with her participation, which is a proof of the relevance and importance of her research. Some of the

papers have an impressive number of citations, such as publication No. 63, which has a remarkable number of citations - 66, publication No. 70 - 15 citations, publications No. 62 and 85 - 12 citations each, etc. The participation of the candidate in scientific forums with poster or oral reports is very active - a total of 83 participations, 72 of which are in the post-habilitation period.

5. Participation in research projects and fundraising

Assoc. Prof. Dolya Pavlova-Tonkova presented a report on her participation in the implementation of 23 research projects, of which 1 international (COST action) funded by the EU; 6 national projects with external funding for Sofia University (5 funded by Ministry of Science and Education /MSE/ and 1 by MOEW) and 4 inter-institutional projects of the research sector of Sofia University. She has successfully managed 8 projects, 4 funded by the MSE, and 4 inter-institutional projects. She was a scientific consultant for one project funded by MSE. The funds attracted by her are worth a total of BGN 234,200. All this gives me confidence to conclude that the applicant possesses the necessary qualities and experience to organize and lead a research team, as well as to generate ideas and hypotheses and successfully implement them.

6. Questions

My questions are two:

- What necessitates the use of the category “higher plants”, given that modern classifications reject it?
- What are your future research plans?

7. Conclusion

Based on the materials presented at the competition by Assoc. Prof. Dolya Pavlova-Tonkova, I firmly believe that it fully meets, and by some indicators exceeds the national criteria for occupying the academic position of “Professor”, determined by requirements of the Law for the development of the academic staff in the Republic of Bulgaria and the Rules for its implementation, the Rules for the Structure and Activity of Sofia University, and the Rules on the Terms and Conditions for acquisition of Academic degrees and occupation of Academic positions at Sofia University “St. Kliment Ohridski”. The colleague is an established scientist, with a clearly defined scientific profile and with proven scientific and applied contributions, as well as a lecturer of indisputable qualities. Her field of interest is of

scientific and applied interest. My impression is that Assoc. Prof. Dolya Pavlova-Tonkova is a very good professional, correct and extremely precise scientist and teacher.

On the basis of the above, I strongly recommend the members of the Scientific Jury to support to support the promotion of Assoc. Prof. Dolya Pavlova-Tonkova in the academic position „Professor“ in professional field 4.3. Biological sciences, specialty “Botany” (Vascular Plants) for the needs of the Faculty of Biology, Sofia University “St. Kliment Ohridski”.

08.11.2019 г. Reviewer:

Sofia (Prof. PhD S. Bancheva)