

REVIEW

on the competition the academic post “Professor” in the field of higher education: 4. Natural Sciences, Mathematics and Informatics, professional field 4.3. Biological Sciences (Botany - Systematics of Higher Plants) at Sofia University “St. Kliment Ohridski”, announced in SG№59 of July 26, 2019,

by Prof. Dr. Veneta Mihova Kapchina-Toteva, appointed as a member of the Academic Board, according to Order No. RD 38-542 / 12.09.2019 of the Rector of Sofia University "St. Kl. Ohridski".

I. Applicant's professional and career development. Associate Professor Dr. Dolya Kalcheva Pavlova-Tonkova is the only candidate in the competition for professor announced for the needs of the Department of Botany, Faculty of Biology at Sofia University “St. Kl. Ohridski”. She graduated pre-school pedagogy in 1979 at the Teachers' Institute “L. Stanev” in Pleven, and specialty Biology (Botany specialization) in 1984 at the Sofia University. She successfully defended her dissertation in the Department of Botany on the topic: "Biosystematic study of the genus *Astragalus* (Klin) in Bulgaria" in 1988. Since 1989 she has become Senior Assistant (1989-1997), Assistant Professor (1997 – 2002), and Associate Professor in the Department of Botany (since 2002 to present).

An important factor in establishing Dr. Dolya Pavlova as a well-established and erudite lecturer is research in the field of higher plants (exploration of the higher flora on serpentine terrains, use of serpentine as a model system for studying the fundamental question of speciation), teaching activity, including high auditory (297 hours) and total (413.6) average employment over the last 5 years, active participation in research projects and administrative involvement (Attestation Committee, Scientific Committee, Committee on Quality, member of the Board of the specialties Molecular Biology and Biomanagement and Sustainable Development in the Faculty of Biology at Sofia University "St. Kl. Ohridski").

Regardless of her teaching experience, she participates as an academic mentor in the Human Resources Development Program, on the advisory board of the LIFE AGROMINE project, in reviewing projects at the Federal Research Fund at the Sofia University (in total 42 projects), in scientific juries for the degree of Doctor (3 juries) and occupation of academic positions (Assistant Professor, Associate Professor) (4 juries), in editorial boards of scientific publications (3 boards), in reviewing articles for renowned scientific journals: Australian Journal of Botany (IF); Biology (IF); Biological Trace Element Research (IF); The Botanical Journal of the Linnean Society (IF); Caryologia (IF); Chemosphere (IF); Journal of Pharmaceutical and Biomedical Analysis (IF); Ecological Research (IF); Periodico di mineralogia (IF); Italian Journal of Agronomy; Botanica Serbica; Phytologia Balcanica.

II. Teaching experience. All the lectures, exercises and teaching practices developed and delivered by Assoc. Prof. Dolya Kalcheva Pavlova-Tonkova are at Botany, and her research work with students in the Bachelor's and Master's programs is extremely active:

1. Botany III (Lectures and Exercises) - Bachelor's Degree Course;
2. Systematics of higher plants (lectures and exercises) - compulsory course for Bachelor's Degree;
3. Taxonomy and evolution of higher plants (lectures and exercises), Higher flora of Bulgaria (lectures and exercises) - compulsory courses for MP Botany;
4. Pre-diploma practicum for Master students;
5. Practice in Botany, Plant Systematics for Bachelor students and Botany-Higher Plants for Master students;
6. Biology (Lectures) - Compulsory Master's Degree Program for the Faculty of Science of Education and Arts, Sofia University "St. Kl. Ohridski";
7. Honorary Lecturer in Pharmaceutical Botany (lectures and exercises) for students at the Medical University of Pleven and the Medical College;
8. Training of students in the ERASMUS + KA 107 program in foreign language teaching (a series of lectures related to science subjects in her field);
9. She supervised 11 successfully defended graduates and 1 doctoral student;
10. Participation in student projects presented on 17 scientific forums, scientific publications in co-authorship with students - 13, which shows her commitment in improving students' qualification;
11. Co-authored 8 textbooks – which is an important contribution to her teaching activity.

III. Research and publication activities, citations. In the competition for "Professor", Assoc. Prof. Dolya Kalcheva Pavlova-Tonkova, Ph.D participates with a total scientific production of 114 publications with total IF 29,668; 83 participations in scientific forums, 649 citations (h index 8) in reputable IF/SJR journals such as: *Flora*, *Phytocoenologia*, *Pharmacognosy Reviews*, *Biologia*, *Plant Biosystems*, *American Journal of Botany*, *Caryologia*, *Plant Systematics and Evolution*, *Phytotaxa*, *Genome Biology and Evolution*, *Australian Journal of Botany*, *Food and Function*, in Dissertations and Books. The publications related to the doctoral dissertation (3 publications and dissertation summary) and 50 publications in the competition for Associate Professor and 14 others are not subject to review. The scientific publications presented in the competition for "Professor" and subject to review are 47 (N 54-100), of which:

- Publications in refereed and indexed journals - 24, with total IF/SJR - 23,951;

- Publications in scientific journals without IF/SJR - 8, and 4 of them with citations;
- Publications in conference proceedings – 2, with citations;
- Publications in books - 5;
- Published university textbooks or textbook used in the school network - 8;

The personal participation of Assoc. Prof. Dolya Kalcheva Pavlova-Tonkova in the 47 scientific papers is undoubtedly illustrated by the fact that in 39 of them (83%) she is primarily the first or second author, while in the others she is the third or subsequent author.

IV. Participation in scientific projects and programs. The research was supported by the participation in the development of 24 research projects: one international project, 11 funded by national organizations, including funds and operational programs 4 of which is the head, and 12 inter-institutional 4 of which is the head. The activity of Assoc. Prof. Dolya Kalcheva Pavlova-Tonkova in the development and implementation of projects, which have contributed significantly to its development and to the improvement of the educational and research base of the Faculty of Biology, is evident.

My conclusion on this part of the analysis of the scientific activity of Assoc. Prof. Dolya Kalcheva Pavlova-Tonkova, PhD, is that the procedure has been followed and the documentation has been prepared in accordance with the requirements of the Regulation for the implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria (or ZRASRB) and the regulations for its application for occupying an academic position of "Professor". The candidate's scientific production submitted for the competition does not include works that go beyond the main nomenclature specialty. She participates in the competition with fully qualified professional discipline of the volume and quality of scientific works, exceeding the minimum requirements of the law and the regulations for its implementation.

V. Contributions. Dr. Dolya Kalcheva Pavlova-Tonkova's research profile is in the field of biosystematic studies of species of the Bulgarian flora: floristics, systematics, biosystematics, ecology (analysis of the features of macromorphological features, chromosomal numbers of species of the Bulgarian flora, chorological information for taxa from different parts of the country, including protected areas, phytochemical characteristics of target species, pollen morphology of selected species, etc.). In recent years, the flora of serpentinite regions of Bulgaria has been actively investigated and the concentration of heavy metals in plants from these regions evaluated. The quality of scientific development is evidenced by the publication of results in prestigious international journals with IF such as the Botanical Journal of the Linnean Society, Journal of Plant Nutrition and Soil Science, Biological Trace Element Research, Taxon, Plant Biosystems and others.

The defining characteristic of the research activity of Assoc. Prof. Dolya Kalcheva Pavlova-Tonkova is the indisputable relevance of the scientific fields in which she worked, which

led to significant results with original and applied scientific character. The author's reference includes the contributions presented in the Extended Rehabilitation References (Indicator B4, Scientific Papers №54-68) and in publications outside the Rehabilitation Reference (Indicators G7 and G8, Scientific Papers №69-92).

Localized and classified into two groups are the serpentinite sites with the largest areas. In total, 440 species were established, subspecies and varieties of 229 genera were found belonging to 59 families in the Eastern, 176 in the Middle Rhodopes (№№ 54, 55, 65, 66), similarity in taxonomic structure with respect to the richest species and genera families and number of endemics (№№ 54, 55, 66, 67, 68).

Three new higher plants species has been described, which belong to the families Brassicaceae, Boraginaceae and Caryophyllaceae, respectively *Aethionema rhodopaeum* D. Pavlova (№56), *Onosma pavlovae* (D. Pavlova) Tan & Petrova (№58) and *Silene fetlerii* D. Pavlova, are described (№64), obligate serpentinitephytes with local, restricted distribution and vulnerable populations, some of which are included in the Red Data Book of the Republic of Bulgaria, item 3 Habitats (2015). New chorological information has been presented, with the number of newly established taxa being 34 in the Eastern Rhodopes and only 1 in the Middle Rhodopes (№№ 54, 67). For the first time, local indicator species have been identified as a source of information on the evolutionary processes and specificity of serpentinite terrains (№№ 54, 55, 66, 68) in Bulgaria and the number of endemics and species with conservation significance, as well as the degree of threat of their populations (№№ 54, 55, 66, 67, 68). As a result of the analyzes of serpentinite flora in the Rhodopes, the origin, specificity and relations with serpentinite flora from other countries of the Balkan Peninsula have been proven.

For the first time an anthropogenic influence on the natural serpentinite flora and distribution of ruderal species has been analyzed (№65). The pioneering role in restoring the natural serpentinite vegetation of species such as *Juniperus communis* L., *J. oxycedrus* L., species of the genus *Rubus*, *Rosa*, *Prunus*, *Crataegus*, *Pyrus*, *Cistus*, etc., together with cereals of the genus *Festuca*, *Dischantium*, *Koeleria*, *Chrysopogon*, *Poa*, etc., as well as the presence of invasive species *Robinia pseudoacacia* L. and *Ailanthus altissima* (Mill.) Swingle.

The karyotypes of serpentinite plants in the Rhodope Mountains have been studied and analyzed [No. 57], new chromosomal numbers for local endemites and serpentinitephytes *Aethionema rhodopaeum* D. Pavlova ($2n=24$) and *Silene fetlerii* D. Pavlova (sub *S. spergulifolia*) ($2n=24$) have been identified; for the first time were established the chromosomal numbers of *Thlaspi apterum* Velen., *Arenaria procera* Spreng. subsp. *procera*; *Silene fabarioides* Hausskn., *Thlaspi ochroleucum* Boiss. & Heldr. The analysis proves that representatives of different taxonomic groups most often remain conservative in terms of their chromosomal numbers and alter karyotypic morphology through chromosomal rearrangements.

The morphological variability in populations of *Teucrium chamaedrys* L. (№59) and *T. polium* L. (№60) in serpentinite and non-serpentine populations has been analyzed, thus proving the influence of this type of scale on plant speciation.

The number of taxa found in the Rila, Belasitsa, Ograzhden and Vlachina mountains on serpentine terrains turns out to be significantly smaller compared to the data from the Eastern Rhodopes, respectively 136 for Rila (№69); 115 for Belasitsa (№№84), 121 for Ograzhden (№85) and 149 for Vlachina Mountain (№85). It has been performed analysis and comparison of the distribution of endemic, rare and species of conservation importance from the serpentinite terrains in the Rila Mountains with those in the Rhodope Mountains, Belasitsa and the Western Boundary Mountains (Vlachina and Ograzhden) (№№ 69, 84, 85). In all serpentine sites, except those in the Western Border Mountains, species of conservation importance for the European flora included in the International Red Lists of Protected and Rare Species were found.

New chorological data for species from different floristic regions are presented: Western Boundary Mountains 16 taxa (№ 85), Belasitsa 14 taxa (№84) and Sredna Gora 15 taxa (№№ 88, 89).

The karyotype of species has been analyzed, both from the flora of Bulgaria and from other countries (Albania, Greece, Spain, France), a new chromosomal number of the local endemic and serpentinophyte *Alyssum markgrafii* ($2n=32$) (№74) has been established, *Astragalus monspessulanus* L. subsp. *illyricus* (Bernh.) Chater ($2n=16+1B$) (№77). Populations of 6 species of serpentinite terrains in Bulgaria and Albania were studied (№№ 74, 77).

The conservation status of rare and endemic plants of the Albanian flora in the Devol catchment (№87) has been evaluated.

For the first time, vegetation was analyzed in 5 serpentine sites from the Eastern Rhodopes and compared with that from other Balkan countries, a new association *Onosmo pavlovae* - *Festucetum dalmaticae* was proposed to the alliance *Alysson heldreichii* Bergmeier et al. 2009, described by serpentinites in Northern Greece. Similar or vicarious endemic associations have been confirmed on isolated serpentinite terrains in Northern Greece and Southeastern Bulgaria (№72).

Data on the content of biologically active substances in the investigated species, the identification of indicator species and hyper-accumulators of nickel are of original scientific and applied nature.

Medical plants growing on serpentinite have been analyzed for the content of metals, as the total amount of metals being species specific, varying between populations of the same species and, despite the absence of industrial contamination, collection of plant substances for medical purposes is not recommended (№№ 61, 62).

Plants-Ni accumulators (*Alyssum murale* Waldst. & Kit., *A. murale* subsp. *pichleri* (Velen.) Stop. & Stef.; *Thlaspi praecox* Wulfen and Jacq., *Th. apterum* Velen., *Th. ochroleucum* Boiss. & Heldr. (№63), *Thlaspi kovatsii* Heuff, have been established for the first time in the Bulgarian serpentinite flora (№69).

The negative effect of nickel was investigated on pollen germination and pollen tube length in serpentinite and non-serpentine populations of *Arabis alpina* L. (No. 76), on cell division in root meristem cells of *Plantago lanceolata* L. (№78), germination of seeds of obligate (*Alyssum markgrafii*) and optional (*Alyssum murale*) serpentiniophytes and Ni - hyperaccumulators, species relevant for agricultural practice (№ 81). Data are available on the relationship between the viability and the germination rate of *A. markgrafii* and *A. murale* seeds from different serpentinite populations (№86).

The localization of nickel in the tissues of the stamens and pollen in Ni - accumulating plants of the genus *Alyssum* from different serpentinite regions is clarified. Two pollen types and two subtypes are distinguished based on the size and shape of the pollen, which are confirmed by hierarchical cluster analysis (№75). The localization of nickel in the pollen grains of the local serpentinite endemic species *Orobanche nowackiana* Markgr., a parasite on the Ni-hyperaccumulator *Alyssum murale*, was established for first time. The characteristics of the pollen grains of the parasitic plant were presented, it was established the variability in the pollen production, both in the flowers and in the anthers of the same individual (№82).

For the first time, the parasite-host relationship between *Orobanche nowackiana* and *Alyssum murale* is analyzed. The metal accumulation in the various organs of the parasite and the host was determined, as well as the effect of the parasite on the growth of the host: a lower concentration of nickel in all the host organs, reduction of biomass, which is a potential threat to the use of the host for agricultural needs practice (agronomy) (№79).

In total, 63 taxa of higher plants of the Albanian flora were checked for nickel accumulation / hyperaccumulation and the hyperaccumulation of this metal was demonstrated in all studied populations of *Alyssum murale*, *Alyssum bertolonii* Desv. subsp. *scutarinum* E. I. Nyàràdy, *Alyssum markgrafii*, *Bornmuellera baldaccii* subsp. *markgrafii* O.E. Schulz (№70). Similar studies have been conducted on species of the Bulgarian flora (№83).

The content of metals in plant substances, aqueous and methanolic extracts from serpentinite and non-serpentine populations of the widely used in the traditional medicine plant *Hypericum perforatum* L. was analyzed, which was dependent on the metal content in the soil and was above the limit values for the elements Cd, Ni and Cr, a risk to human use when plant material is collected from serpentine regions (№73). Increased flavonoid content has been demonstrated in all species growing on serpentinite as a protective reaction of the species to specific environmental conditions (№71). The various stages of the study of soil suitability (fertility and nickel availability) and plant selection (the potential for phytoextraction of Ni-hyperaccumulating species) to optimizing agricultural practices to introduce agronomy in the Balkans (№92) are

presented. A study and evaluation of the natural process of colonization at abandoned sites after the extraction of Fe-Ni from plants and the potential of hyperaccumulating plants for soil phytoremediation (№80) were performed. Proposed for conservation and promotion are serpentinites as habitats with unique flora and vegetation, associated with an adaptive strategy for survival under extreme edaphic conditions, species-forming processes and evolution, as well as establishing them as a "hot spot" of World Natural Heritage (№№ 90, 91).

Important contributions to the applicant's teaching work are the developed teaching aids: a textbook and a manual on Systematics of higher plants for students, textbooks (2) and a study notebook (2), a teacher's book (2) for Biology and health education for 7th grade students (№№ 94,95,96,97,98,99,100).

CONCLUSION

I know Assoc. Prof. Dolya Kalcheva Pavlova-Tonkova, PhD as a highly qualified, erudite and efficient scientist. Based on the analysis of the pedagogical work (auditorium at Bachelor's and Master's degrees), active research activity, expert activity, volume of scientific production, interpretation of scientific data and contributions, their reflection in international scientific literature, participation in research projects, presentation of the results at international and national scientific forums, I am convinced that Assoc. Prof. Dolya Kalcheva Pavlova-Tonkova fully meets the requirements of the ZRASRB, PPZRASRB and the Regulations and the recommended criteria for academic positions at Sofia University "St. Kl. Ohridski". All this gives me reason to rate the POSITIVE overall activity. I propose that the honorable Academic Board votes in the affirmative, and the Faculty Board of the Faculty of Biology at Sofia University "St. Kl. Ohridski" to select Assoc. Prof. Dolya Kalcheva Pavlova-Tonkova, PhD, as "Professor" in the professional field 4.3. Biological Sciences (Botany-Systematics of Higher Plants).

Date: 11/11/2019

Sofia

Reviewer:

(Prof. Veneta Kapchina-Toteva, PhD)