РД-08-1004/30.08.21

REVIEW

on the materials submitted for participation in the competition for the occupation of the academic position "**Associate Professor**" in the field of higher education 6. Agrarian Sciences and Veterinary Medicine, professional field 6.1. Plant growing, scientific specialty "Soil Science", announced by the Forest Research Institute - BAS in the State Gazette No. 35/27.04.2021

Candidate for participation in the competition: In the competition for the occupation of the academic position "Associate Professor", announced for the necessities of the "Forest Genetics, Physiology and Cultures" department, one candidate participates: **Chief Assistant Dr. Vanya Georgieva Kachova**

The Review is prepared by: Prof. Dr. Maria Grozeva Sokolovska, appointed as a member of the Scientific Jury by Order № RD 15-277/30.06.2021 by the Director of the Forest Research Institute - BAS, Professor in Professional field 6.1. Plant growing, scientific specialty "Soil Science", retired

1. Brief biographical data

Chief Assistant Dr. Vanya Georgieva Kachova was born on April 20, 1964 in the town of Dospat. She graduated from high school in Vidin, at the Polytechnic High School "Dimitar Blagoev" in 1982. In 1988 she graduated from Sofia University "St. Kliment Ohridski" and received a master's degree in analytical and organic chemistry. Since January 1999 she has been a Ph.D. student at the Laboratory of Forest Soil Science at the Forest Research Institute - BAS. In 2006, after successfully defending a thesis on "Heavy metals in soils from urban oak ecosystems in the Sofia region" in front of the Specialized Scientific Board in Soil Science, Agrochemistry and General Agriculture at the Institute of Soil Science "N. Pushkarov", she received a Ph.D. degree in the scientific specialty "Soil Science". During this period she has conducted two specializations at the Institute of Soil Science "N. Pushkarov" in connection with the study of soil organic matter and sorption properties of soils. In the years 1989-1992 she worked as a biologist at the Institute of Plant Physiology - BAS, and in the period 1994-1995, as a Teacher of Organic Chemistry and Sources of Environmental Pollution, Technical School of Chemistry and Economics "Assen Zlatanov" in Vidin. From 1996 to 1999 she worked as a chemist in the laboratory of Forest Soil Science at the Forest Research Institute - BAS. Later, in 1999, she became an assistant and since 2007 she has held the academic position of Chief Assistant at the same laboratory. Since 2013 she has been a Chief Assistant in the section "Forest Genetics, Physiology and Cultures" at FRI-BAS, where she currently holds the position. She is the chairman of the Bulgarian Society of Agroforestry, part of EURAF. She is a member of the International Society for Soil Science, the Bulgarian Society for Soil Science and the Bulgarian Society for Humic Substances. She speaks English very well.

2. Compliance of the submitted documents and materials of the applicant with the minimum requirements, according to the Regulations for acquiring scientific degrees and occupation of academic positions at the Forest Research Institute - BAS.

Submitted documents and materials for the competition are in accordance with the requirements of the Act on Development of the Academic Staff in the Republic of Bulgaria - ADASRB (Art. 24) and the Regulations for its application, the Regulations on the Terms and Conditions for Acquisition of Scientific Degrees and for Occupying Academic Positions at the Bulgarian Academy of Sciences (BAS), as well as additional documents, determined in the Regulations for the conditions and the order for acquiring scientific degrees and for

holding academic positions in FRI-BAS, by the order of art. 13, paragraph 4. According to the presented "Reference - self-assessment of the minimum national requirements of scientific and teaching activities for the academic position of "Associate Professor "Dr. Kachova exceeds the required points for the five groups of indicators (A, B, G, D, E). The total amount of points is **1014,5**, with a required minimum of 500 points. The table below provides information on the criteria for holding the academic position of "Associate Professor" (according to the Annex to Article 1a, paragraph 1 of the Regulations for application of the ADASEB), and in comparison, the minimum required number of points under the Regulations of FRI-BAS and the number of points calculated for the publications, citations and activities of the candidate participates in this competition are indicated..

Group of indicators		Number of points	
		Minimal for FRI-BAS	Achieved by the candidate
A. Dissertation work for awarding educational and scientific degree "doctor"		***50***	***50***
B. 4. Habilitation work - scientific publications (not less than 10) in publications that are referenced and indexed in world-famous databases with scientific information		***100***	***240***
G.	7. Articles and reports published in scientific journals, referenced and indexed in world-famous databases with scientific information		207,5
	8. Articles and reports published in non-referenced journals with scientific review or published in edited collective volumes		32,0
	Total for the group:	***200***	***239,5***
D.	13. Citations or reviews in scientific journals, referenced and indexed in world-famous databases of scientific information or in monographs and collective volumes		210
	14. Citation in monographs and collective volumes with scientific review		70
	Total for the group:	***100***	***280***
E.	18. Participation in a national scientific or educational project		15
	19. Participation in an international scientific or educational project		60
	20. Management of a national scientific or educational project		90
	21. Management of an international scientific or educational project		40
	Total for the group:	***50***	***205***
	Total:	**500**	**1014,5**

Larger distinctions in group B, group D and group E are observed. Dr. Kachova has another **49 points** of additional indicators (advantage) according to the Regulations of FRI-BAS. The attached documents contains some inaccuracies such as wrong year of publication (subgroup B4), inaccurate surname of the author and absence of the place of publication of the article (subgroup G8). For the additional requirements of FRI-BAS the candidate has presented detailed information about her participation in scientific forums with reports/posters, lectures, reviews, expertise and opinions. A careful review of the materials submitted to me for review gives me reason to claim that there is no legally proven plagiarism in the scientific works of Chief Assistant Vanya Kachova and she fulfills the condition specified in Art. 24, paragraph 1, item 5 of ADASRB. From the evidence provided in this competition it can be seen that Dr. Vanya Kachova meets and exceeds the minimum national requirements for holding the academic position of "Associate Professor", specified in the Regulations for the implementation of ADASRB.

The attached Habilitation Extended Reference for Scientific Contributions distinguishes 10 scientific publications (№№ B4.1 to B4.10 from the Bibliography to the reference) in publications that are referenced and indexed in world databases (Web of Science and Scopus),

as equivalent number of articles for equating to a monographic work, requirement under Note 12 of the Annex to the Regulations for implementation of ADASRB. The habilitation reference with the monographic title "***Studies on the quality characteristics of forest soils and ways to improve them***" contains the following main scientific contributions: The influence of fertilization on saplings from *Acer platanoides* L. with organic or a combination of organic and mineral fertilizers on the microbiological activity of Vertisols has been established; It is recommended to extract the amino-acetate extractable forms (mobile forms) of Cu, Zn, Pb and Cd (at pH = 7), which are "biologically active" or "bioavailable" forms of potentially toxic elements (PTE) in urban soils with anthropogenic origin; The role of woody vegetation to locate heavy metals in the soil at a smaller distance from the road network than in meadow vegetation has been confirmed; It is established that under oak ecosystems from the forest parks of Sofia and Sofia region the mobile forms of Cu, Zn and Pb predominate in the upper 0-5 cm of the soils, and those of Cd migrate to a depth of 0-20 cm and are present as residual, non-extractable fraction are not available for plants, ie. parks can be used for recreation; The positive impact of import of waste from the paper industry and fertilization or only fertilization (N-P-K) of man-made substrates for the growth and accumulation of biomass in the tree species *Quercus rubra* L. and *Pinus Nigra* Arn has been proven and their use in phytoremediation of contaminated sites; It is recommended that the biological reclamation of soils geochemically enriched with lead or contaminated with other heavy metals (Cu, Zn, Cd) be carried out with the species *Pinus nigra* Arn., *Quercus rubra* L. and *Quercus sessiliflora* Salisb.; The impact of the applied agroforestry practices for improvement of the soil environment (acidity), the content of carbon and nitrogen, the qualitative composition of the organic matter (humus) in the early stages of cultivation of acacia crops (*Robinia pseudoacacia* L.) and in poplar crops (*Populus* sp.) along the Danube River on alluvial soils (*Alluvial Fluvisols*) has been confirmed.

3. General description of the submitted materials (by type; by importance; place of publication; language in which they are published; number of co-authors, etc.)

Dr. Kachova has presented a complete set of materials on the competition, according to the requirements of the ADASRB and the Regulations for its application. The "Summary list of scientific production" contains a total of 55 publications, and the number of scientific articles that are subject to review is **27**, relating to categories B4, G7 and G8. The other publications are related to the receipt of ESD "Doctor" (2 copies), the competition for "Chief Assistant" (6 copies) and publications that are not submitted for participation in this competition (20 copies).

By type and place of publication: • articles in foreign/national publications, referenced and indexed in world-famous databases with scientific information (Web of Science, Scopus, etc.) - 19 pcs. • articles published in unreferred journals with scientific review - 8 pcs.

In the language in which they are published: • in Bulgarian -11 pcs. • in English - 16 pcs.

By number of co-authors: • individual - 6 pcs. • with one co-author - 10 pcs. • with two co-authors - 5 pcs. • with three or more co-authors - 6 pcs.

The above, together with the presented information on the conformity of the materials submitted by Dr. Kachova to the minimum requirements, shows that her scientific and publishing activity is good, both in terms of quantity and quality: 16 pcs. (ie 59%) are published in foreign publications; 19 pcs. (ie 70,3%) are in editions referenced and indexed in WoS and/or Scopus. The number of publications in English is 16 and represents 59% of the scientific production of the candidate in the competition. The developed scientific works present the author as an established specialist and are evidence of knowledge of theory and practice in the areas studied by her.

Dr. Kachova's expert work includes the preparation of 11 anonymous reviews for a number of authoritative scientific journals, 10 of which are articles in publications referenced in WoS and Scopus. She has prepared three opinions on two investment intentions and one strategic document/program. I would like to point out that the evidence presented, which was used to assess these additional quantitative indicators and activities, is precisely prepared, and this greatly facilitates the work of the reviewer.

4. Main directions in the research work of the candidate and the most important scientific contributions.

The contributions in the scientific publications submitted for participation in the competition, apart from those included in the habilitation reference, ie. categories G7 and G8 are related to the enrichment of scientific knowledge or obtaining confirmatory data. I believe that the scientific contributions in the presented "Information on more significant scientific and scientific-applied contributions" can be combined in the following 4 axis:

1) Studies of soils under different vegetation: It has been confirmed the role of the type of land use on the accumulation and transformation of the soil organic matter, the C/N ratio, the acid status of the soils, the presence of a significant correlation between C and N, but no reliable one with pH (G8.4). It's made characteristics of soils (*Alluvial Fluvisols*) in the riparian forests of the islands of the Danube and found two varieties of the soil type with different duration of soil formation processes, differences in mechanical composition, organic carbon content, predominance of fulvic acids in the composition of humus , greater lability of organic matter (G7.8).

2) Sorption characteristics of soils under woody vegetation: It was found that the base saturation (BS) in the surface horizons of brown forest soils (*Dystric-Eutric Cambisols*) under beech plantations from the Central Balkans and Osogovo varies from 33,0 to 75,0% of the total sorption capacity. It has been shown that the negative charges of soil colloids, which behave as strong acids (TCA), exceed the values of BS due to the additional proportion of H^+ and Al^{3+} acid cations (G7.4). Alkalization of the surface horizons has been established in urbanized soils of the Sofia valley, and in the case of technogenic soils from the metallurgical production this process is along the entire profile. Urbanized and man-made soils are saturated with bases and have high values of total sorption capacity (T8,2 = CEC). Traces of Al exchange are also observed in urbanized soils, but it is absent in technogenic soils (G8.3). Established are higher values of pH in the surface layer of anthropogenic soils (*Urbic Anthrosols*) from the city park of Sandanski, higher spatial variability in the accumulation of organic carbon, lower degree of humification of the organic matter, average intensity of the flowing acidic processes, lower values of exchangeable aluminum, moderate colloid in the surface layers (T8,2 = 20-30 meq / 100 g soil), compared to natural soils (*Chromic Luvisols*) located outside the urban area (G8.2).

3) Microbiological activity of forest soils: Proven is the strong influence of vegetation density in natural oak ecosystems as a component most strongly influencing soil biogenicity, the level of heterotrophic microorganisms in the total soil microflora at a metabolic coefficient of 0,20 to 0,44 (G7.2). Confirmed is the importance of climatic conditions and plant density as factors with the strongest influence on the size of microbiological communities in urban soils of two cities, differing in population, level of urbanization and the presence of higher biological activity at lower anthropogenically loaded soils with a microbial respiration rate of 0,18 to 0,45 (G7.3).

4) Main characteristics of anthropogenic soils: Established are changes in the acid-base balance of soils from urbanized areas under oak plantations in the Sofia region, the course of processes of alkalization of soils affected by anthropogenic activity. It is established lower participation of organic colloids in the formation of the total sorption capacity in urban soils

compared to those under natural conditions. (G8.5). The main conclusions about the specific features of urban soils are made, based on information from literature sources and supported by experimental data by the authors such as heavy metal pollution, variations in the composition of soil organic matter, changes in sorption capacity due to higher levels of saturation with exchange bases, lower water capacity, greater compaction with low sludge differentiation, presence of dust and materials from urban construction, deceptions in microbiological indicators (G8.6). It has been shown, by applying a chemical, soil-genetic and statistical approach, that heavy metals in anthropogenically affected soils from the Sofia region can have different origins in the surface and deeper soil horizons under the influence of different types of anthropogenic activity - urbanized soils, soils from the area of metallurgical activity, soils under sludge from WWTP (G8.7). An assessment of the condition of soils and vegetation (black pine *Pinus nigra* Arn.) Was performed 30 years after the biological reclamation of soles by MK "Kremikovtsi" near the village of Lokorsko. A high degree of saturation with soil bases, relatively good supply of organic matter, pollution with heavy metals (Cu, Zn, Pb and Cd) in the soil and dead forest cover have been established. The black pine plantation is developing relatively well and sustainably (G7.1). It has been proven differentiated course of humus formation and humus accumulation in soils under three tree species - black pine (*Pinus nigra* Arn.), birch (*Betulla alba* L.) and ash (*Fraxinus pennsylvanica* Marsh), 45 years after reclamation of soles in the territory of Baikusheva mahala Pernik, near the mine "M. Tolbukhin". Established are larger quantities of org. C, lower degree of humification, sufficient amounts of more stable hulvic acids under ash crops. It has been received higher degree of humification, formation of larger amounts of fulvic acids and more labile composition of the newly formed humus in the substrates under coniferous crops (G7.9). Differences in the origin of the constituent materials, in the chemical and physico-chemical characteristics of soils and substrates from the Pernik coal mining region, natural and recultivated, which determines different buffering capacity at external sources of influence are established. The content of organic matter in the reclaimed soles testifies to the course of processes of humus formation and humus accumulation, mainly in the surface layers. Favorable physicochemical status of the reclaimed soles was determined at high degree of base saturation and the predominance of exchanged calcium (G8.8).

5. Most significant scientific and applied achievements and implementation activity.

The most significant scientific and applied achievements of the candidate can be summarized in one direction - "Use of fertilizers and improvers to improve soil characteristics and plant growth":

- The advantages of the sludge from the vacuum filter of treatment plants in the pulp processing plant have been proven as suitable for reclamation of technogenic substrates from metallurgical plants with woody vegetation - red oak (*Quercus rubra* L.) (G 8.1).

- Better effect for accumulation of more dry matter, C and N in the leaves, improvement of soil acidity, increased stock of org. C, good composition of the organic matter in the soil with a higher amount of humic acids after fertilization of ryegrass with organic fertilizer "Siapton" in combination with mineral fertilizer "Kristalon" has been established (G7.5).

- Advantage of a combination of two organic fertilizers - "Siapton" and "Biohumus", when fertilizing saplings of *Acer platanoides* L. to increase the diameter at the root collar and that of chest height, improving the composition of humus, increasing the ratio Ch/Cf of soils, as well as recommendations for fertilization for the needs of forestry and urban development It has been confirmed (G7.6; G7.7).

6. Reflection of the candidate's scientific publications in the literature (citation).

In the list of found positive citations (category D) a total of 21 numbers for 10 cited publications of the author are indicated. Most of the citations are in scientific journals, referenced and indexed in world-famous databases with scientific information (Web of Science, Scopus), for which detailed evidence is presented (D13 - 14 or nearly 67%). The rest are in monographs or collective volumes with scientific review (D14 - 7 pcs.). The received total number of points for category D, according to the Regulations in FRI-BAS, exceeds twice the required minimum of 100 points. Most of the references are for articles of which the candidate is the first or sole author. Of the citing authors, only 5 are Bulgarian, and the remaining 16 are foreign authors working on this topic.

7. Participation in scientific and applied projects.

According to the presented "Self-assessment report for scientometric indicators" for category E - management and participation in projects, Dr. Kachova collects a total of 205 points (with a required 50), which exceeds many times the minimum requirements for this category. She is the manager of 4 projects (at least one is required), of which 3 projects from the budget subsidy of BAS (E20) and one from the bilateral cooperation of BAS (E21). Participates in the development of 4 projects (at least two are required), of which one with national funding from the NSF/MES (E18) and one from the bilateral cooperation of BAS (E19). Since 2014, the candidate has been a member of the Management Committee of two COST actions. The developed projects are related to current scientific and applied problems, directly related to the topic of the competition.

8. Teaching and learning activities (supervisor / consultant of doctoral students, student training, etc.) No evidence provided by the candidate for teaching and learning activities.

9. Assessment of the personal contribution of the candidate.

The personal contribution of the candidate Dr. Kachova in the presented scientific works is significant - 6 of the publications are independent, and of 16 she is a leading author, which in total represents 81,5% of her total production. In the research projects the candidate's contribution is defined in the presented evidence for the implementation of 4 national and 4 international projects. She participates in 8 international and 8 national scientific conferences, where she presents 5 posters and 11 oral presentations, of which 10 are by herself or a leading author.

10. Critical remarks and recommendations.

The scientific works of the candidate are in-depth and reflect the results obtained using modern methods. I accept the contributions in the habilitation reference for criterion B and the reference for the scientific contributions in the publications for criterion G. In unifying according to the main axis, some repetitions or overlaps with the summaries can be avoided. I recommend Dr. Kachova to intensify her publishing activity in renowned foreign scientific journals in order to find her works more widely recognized. I would advise her to focus more actively on independent scientific summaries and training of doctoral students. I would encourage her to continue working with the same perseverance and confidence.

11. Personal impressions.

My personal impressions of the candidate are from the time when she started working as a chemist in the laboratory of Forest Soil Science at FRI-BAS, and then as a doctoral student and researcher. With wide interests in various fields, she stood out with her in-depth knowledge acquisition and new methodological approaches to conducting research. In our

joint research over the years, I found its growth in terms of accumulated scientific knowledge, experience and opportunities for teamwork, a prerequisite for achieving significant scientific and applied research results. The materials presented in the competition supplement and confirm my long-term impressions of the activity and development of Dr. Vanya Kachova.

12. Conclusion.

Considering the submitted documents and all the works presented above, I believe that the applicant fully meets the requirements of Article 24 of the ADASRB, The Regulations for its implementation, as well as the Regulations and the recommended criteria of BAS and FRI-BAS. She is a confirmed specialist with in-depth knowledge in the field of soil science, and her scientific output has proven qualities. All this gives me reason to evaluate positively her entire scientific activity.

In connection with the above, I propose **Chief Assistant Dr. Vanya Georgieva Kachova to be elected "Associate Professor"** in the professional field 6.1. Plant growing, scientific specialty "Soil Science"

Date: August 31, 2021.

Reviewer:
(Prof. Dr. María Sokolovska)