

REVIEWER REPORT

From Dr. Petko Nedyalkov Denev, prof. at the Institute of Organic Chemistry with Centre of Phytochemistry, Bulgarian Academy of Sciences

on the materials, presented in competition for acquisition of academic degree "professor"

at Medical University "Prof. Dr. Paraskev Stoyanov" - Varna

in area of higher education: 4. "Natural sciences, mathematics and informatics"

professional direction: 4.2. "Chemical Sciences"

scientific specialty: "Chemistry"

for the needs of the Department of Chemistry, Faculty of Pharmacy at the Medical University "Prof. Dr. Paraskev Stoyanov" - Varna

1. General presentation of the procedure and the received materials

By order № P-109-94 from 21.03.2024 of the Rector of the Medical University "Prof. Dr. Paraskev Stoyanov" - Varna (MU-Varna) I have been appointed as a member of the scientific jury in a competition for the academic position of "professor" in the field of higher education 4. "Natural sciences, mathematics and informatics", professional direction 4.2. "Chemical Sciences", scientific specialty "Chemistry". The competition was announced in the State Gazette, no. 7 of 23.01.2024 and on the website of the Medical University "Prof. Dr. Paraskev Stoyanov" - Varna for the needs of the "Chemistry" Department, Faculty of Pharmacy, MU - Varna.

To participate in the announced competition, only assoc. prof. Dr. Albena Vasileva Merdzhanova, head of the Department of Chemistry, Faculty of Pharmacy at the Medical University of Varna, submitted documents. The set of materials presented by assoc. prof. Dr. Merdzhanova is in accordance with the Regulations for the Development of the Academic Staff of the University of Varna and the minimum national requirements of the Law for the Development of the Academic Staff in Republic of Bulgaria (LDASRB) for the academic position "professor". The documents for the competition include: Application from the applicant for admission to participation in the competition; CV; Diplomas for the acquisition of "master" degree, educational and scientific degree "doctor" and for awarding the academic position "associate professor"; Certificate of recognized specialty "Theoretical foundations of medicinal chemistry"; Certificates for internship in the specialty and for pedagogical experience; Study load report; Medical certificate and criminal record certificate; Academic reference for the scientific publications, citations and scientific profiles of the candidate, issued by MU-Varna, including copies of the scientific publications, as well textbooks co-authored by the candidate; Habilitation work - monograph; Reference for original scientific works; Summaries of habilitation work and scientific publications; List of participations in scientific forums; Privacy Notice; Declarations of authenticity of the presented documents and author's consent; Reference for contributions to teaching activities; Doctoral Students Supervision Certificate; Reference for registered profiles in scientific databases; References for editorial activity and membership in scientific organizations;

Assoc. Prof. Dr. Albena Merdzhanova participates in the competition with a habilitation thesis-monograph and 22 scientific publications according to group of indicators Γ of the

Regulations for the Implementation of LDASRB. The distribution of scientific works according to the respective categories of publications is as follows:

In journals referenced in Scopus and/or Web of Science with IF and/or SJR – 18:

Q1	- 4	
Q2	- 3	
Q3	- 2	
Q4	- 9	
Without IF/SJR		- 4
Total:		22

The 22 scientific papers presented are on the subject of the competition, they were published outside the dissertation for the educational and scientific degree "doctor" and were not used in the competitions for awarding the academic positions "chief assistant professor" and "associate professor". For these reasons, they are accepted for review and count toward the final grade.

2. Short biography of the applicant

Albena Merdzhanova obtained a master's degree in "Biotechnologies" from UCTM-Sofia in 1993, and subsequently in 2016, a second master's degree in "Organic Chemistry" from Konstantin Preslavsky University of Shumen. In the period 1993-1996 she worked as a "Hyperbaric Systems" engineer at the Institute of Oceanology-BAS (IO-BAS), Varna. Then, until 2005, she successively held the positions of research assistant, III, II and I degree at the same institute. In 2005, she joined the teaching and research department of "Medicinal Chemistry" at the Medical University - Varna as chief assistant professor and in December 2008 was appointed as chief assistant professor in "Chemistry" in the "Chemistry" department of the same university. In 2014 obtained a PhD degree in Bioorganic Chemistry, Chemistry of Natural and Physiologically Active Substances at the Medical University of Varna after defending a dissertation entitled "Fatty acid composition of Black Sea and freshwater fish". The elaboration of this doctoral dissertation to a large extent also shaped the future scientific interests of Dr. Merdzhanova, aimed at researching the quality, composition and safety of marine and freshwater organisms (fish, mussels, rapana, shrimps, etc.), a topic with which she headed a laboratory is recognizable in the country. After defending her doctoral dissertation, Dr. Albena Merdzhanova held the academic position "chief assistant professor" at the MU-Varna until her habilitation in 2018. In 2023, she was also appointed as the administrative head of the "Chemistry" department at the Faculty of Pharmacy in MU-Varna, a position she holds to this day.

In the period 2014-2018 she attended post-graduate courses and trainings for working with e-learning platform Blackboard Learn and BDS EN ISO/IEC 17025:2018, and in 2020 acquired a specialty in the field of health care "Theoretical Foundations of Medicinal Chemistry" after postgraduate specialization at MU-Varna. Assoc. prof. Merdzhanova is a member of the Bulgarian Society of Nutrition and Dietetics and of the Editorial Board of the journal *Ovidius University Annals of Chemistry*. In addition, she is actively engaged in administrative work in the department she leads and in the Faculty of Pharmacy of MU-Varna. From the analysis of the professional path of assoc. prof. Merdzhanova, it is clear that she is a very active teacher with a desire for constant improvement and increasing her qualifications.

2. General characteristics of the applicant's activities

Evaluation of educational and pedagogical activity

The educational and pedagogical activities of assoc. prof. Merdzhanova include a total teaching experience of 25 years, first as a research assistant (III, II and I degree) at IO-BAS, Varna, then as a chief assistant professor at the same institute and the MU-Varna, and the last 5 years and 3 months as an associate professor in the "Chemistry" department of the Faculty of Pharmacy at MU-Varna. The teaching activity of assoc. prof. Dr. Merdzhanova is very intensive and includes lecture courses in "Chemistry" for students from the specialty Medicine - Bulgarian language training, 1st year; "Inorganic and organic chemistry" of students from the specialty Medical laboratory assistant, College of Medicine, 1st year; "Inorganic Chemistry" of students from the Assistant Pharmacist specialty, Medical College, 1st year; free elective subject "Food Composition and Safety" for Pharmacy students; free elective subject "Perfumes and aromas in cosmetic production" for students from the specialty "Cosmetology", as well as exercises and seminars in "Chemistry" for students from the specialty Medicine - Bulgarian language training; "Chemistry" for students majoring in Dental Medicine - Bulgarian language training; "Inorganic and organic chemistry" of students from the specialty Medical laboratory assistant, Medical College, 1st year "Analytical chemistry" of students from the specialty Medical laboratory assistant, Medical College, 1st year "Inorganic chemistry" of students from the specialty Assistant pharmacist, Medical college, 1st year and "Analytical chemistry" of students from the Assistant Pharmacist specialty, Medical College, 1st year. She participated in the development of the teaching programme "Inorganic Chemistry" for students from the Pharmacist Assistant major; "Inorganic and Organic Chemistry" for students from the Medical Laboratory Technician major and the "Perfumes and Fragrances in Cosmetic Production" for students from the "Cosmetology" major. She is a co-author of two textbooks - "Inorganic and Organic Chemistry" and "Inorganic Chemistry" 1st part for Medical College, and he is also the co-author of two textbooks with tasks and test questions for self-preparation of candidate students in chemistry. Indicative of the intensity of her teaching activity is the fact that for the last four academic years, assoc. prof. Merdzhanova conducted an average of 339 hours of classes with students, with a required minimum of 126 hours per year, which makes a total of 1357 hours for the entire period. Until the announcement of the competition, assoc. prof. Merdzhanova did not supervised graduate doctoral students, but she is currently the supervisor of two doctoral students in independent study and co-supervisor of one regular and one doctoral student in independent training. The current competition do not apply the requirements of Art. 137, para. 1, items 3 and 6 of the Regulations for the development of the academic staff at the MU - Varna, thus fulfilling all other specific requirements of the Regulations for the academic position "professor".

Evaluation of scientometric indicators

The candidate's points by groups of scientometric indicators, defined in Regulations for the Implementation of LDASRB and the Regulations for the development of the academic staff in MU-Varna for the academic position "professor" are as follows:

Indicator	Minimal requirements of MU-Varna	Points declared by the candidate
A	50	50
B	100	100
Г	200	298
Д	100	104
E	150	214

Indicators group A: Assoc. prof. Merdzhanova defended a dissertation on the topic "Fatty acid composition of Black Sea and freshwater fish", prepared in the Department of Chemistry at the University of Varna, which earned her 50 points for this indicator.

Indicators group B: Assoc. prof. Merdzhanova presents a peer-reviewed monograph on the topic "Biologically active fatty acids in support of human health" in a volume of 163 pages, which fulfills the legal requirement for 100 points of the Regulations for the Implementation of LDASRB.

Indicators group Г: Out of 22 scientific publications submitted under this competition, 18 score on this indicator due to the fact that they are in publications referenced in Scopus and/or Web of Science. According to their distribution in the respective quartiles, assoc. prof. Merdzhanova collects a total of 298 points, which significantly exceeds the required minimum of 200 points laid down in the regulations of the MU-Varna.

Indicators group Д: A reference in Scopus shows that the total number of citations (without self-citations) of the scientific works of assoc. prof. Albena Merdzhanova is 124 (h-index – 7). In the competition, she applies with 54 citations outside of those presented for awarding the academic position "associate professor" and the PhD degree. These citations are mostly from foreign authors in foreign editions and carry 104 points, thus meeting the requirement of a minimum of 100 points for this indicator.

Indicators group E: In this group of indicators, the candidate presents data on leadership and participation in international and national scientific projects. To participate in the competition, she declared participation in ten research projects financed by national sources and in two international projects. In addition, she was the head of a project in a competition for "Funding of fundamental scientific research" at the National Research Foundation, which attracted 120 000 BGN for MU-Varna. It should be noted that, in addition to the funds raised, the projects undoubtedly have a beneficial effect on increasing the capacity of the Department of Chemistry headed by assoc. prof. Merdzhanova. From participation in projects and attracted funds, the candidate collects 164 points, which are supplemented by another 50 points for her authorship of two textbooks - "Inorganic and Organic Chemistry" and "Inorganic Chemistry" 1st part for Medical College the two textbooks with tasks and test questions for self-preparation of candidate students in chemistry. Given the fact that for the current competition the requirement of the Regulations for the Development of the Academic Staff at MU-Varna that more than 100

points are from indicator 13 of indicator group E does not apply, the candidate collects a total of 214 points, which significantly exceeds the required minimum of 150 items.

Evaluation of scientific research activity, scientific and applied contributions

Along with the intensive educational and pedagogical activity, assoc. prof. Merdzhanova also demonstrates active research activities. All publications on the competition can be referred to the field of bioorganic chemistry, chemistry of natural and physiologically active substances. In her author's reference, assoc. prof. Merdzhanova divides her scientific research into five directions, which I would summarize as research on "Lipid profile, composition, safety and biological activity of Black Sea and freshwater organisms (fish, mussels, rapana, shrimps) used as food". For me, one of the greatest strengths of her research work is that it is thematically homogeneous and focused. Thus, twenty-one of the scientific publications presented in the competition can be attributed to this direction. Only, the review paper *G7 – 2a* differs thematically from the others, as it presents review information on phenolic compounds in edible plants. In general, its inclusion could have been avoided, but this is rather an insignificant remark, due to the fact that it does not participate in the formation of the total number of points on scientometric indicators.

Assoc. prof. Merdzhanova participated in the first large-scale study in the country on the content of total lipids and omega-3 polyunsaturated fatty acids in eleven traditionally consumed fish species, three types of bivalves and shrimps caught from the western part of the Black Sea. It observed significant differences in the ratios of individual long-chain omega-3 polyunsaturated fatty acids (PUFAs), and health-promoting values of omega-3/omega-6 and PUFAs/SFAs ratios were calculated for all species studied. The first study of the seasonal changes in the chemical composition and fatty acid profile, and the content of fat-soluble vitamins in the Black Sea round goby, which characterizes it as a valuable and useful fish species with a high protein content, low content of saturated fatty acids, high levels of omega-3 polyunsaturated fatty acids and vitamin D3. The seasonal changes in the sterol and fatty acid composition of the total lipids and the lipid classes (neutral and polar lipids) in the edible tissue of the Mediterranean mussel *Mytilus galloprovincialis* cultivated in the Bulgarian Black Sea area were also investigated, and the obtained results characterize this species as sustainable and valuable source of biologically active substances. In another study, the chemical and macronutrient composition (proteins, total lipids, carbohydrates, K, Ca, Mg, Na and energy value) of tissue from the white mussel *Donax trunculus* from the Bulgarian Black Sea coast were investigated. The analyzed samples are characterized by a high protein content of 17.3g/100g and a low lipid content of up to 5.15g/100g. The study presents new data on the chemical composition of *D. trunculus* and shows that this species can be a healthy and quality food. The total phenolic content and phenolic composition of cultured black mussels (*M. galloprovincialis*) grown in the Black Sea were also investigated. The presence of phenolic compounds was confirmed by chromatographic analysis, revealing that farmed black mussels (*M. galloprovincialis*) from the Black Sea could be a good source of phenolic compounds. A new study on the antibacterial activity of extracts from tissues of the Black Sea mussel *Mytilus galloprovincialis* is presented. The extract obtained with ethyl acetate was found to exhibit activity against *Escherichia coli* and *Klebsiella pneumoniae*, and the extract obtained with glycerol:water showed an inhibitory effect on the growth of *Staphylococcus aureus* and *Escherichia coli*.

It is known that heat treatment can significantly affect the quality and lipid profile of foods. To investigate these changes, assoc. prof. Merdzhanova and her colleagues investigated

changes in total lipids, lipid classes, fatty acid composition, fat-soluble vitamins and carotenoids in *Mytilus galloprovincialis* and *Rapana venosa* after heat treatment. Fatty acid groups in phospholipids were found to remain little affected by temperature treatment, while variations in neutral lipids were significant. Heat treatment resulted in a significant loss of vitamin A, β -carotene and astaxanthin, but affected to a lesser extent vitamin E, D3 and cholesterol. The effect of steam cooking on some toxic (Cd, Ni, Pb), essential (Cr, Cu, Fe, Mn, Zn) and macronutrients (Na, K, Ca, Mg), total lipids and fatty acids in Mediterranean mussels (*Mytilus galloprovincialis*) caught from the Black Sea and the content of vitamins and carotenoids in the tissue of the black mussel (*Mytilus galloprovincialis*) and the rapana (*Rapana venosa*) was investigated. The concentrations of all analyzed compounds were found to decrease significantly after heat treatment except for astaxanthin in *Mytilus galloprovincialis*.

A new study is presented on the content of selected toxic and essential elements in the edible tissue of five freshwater fish species from Burgas Lake and Mandra Dam. The levels of the examined Cd, Cr, Cu, Mn, Ni, Pb, Fe and Zn were determined below the maximum permissible concentrations for safe human consumption in Bulgaria. The concentrations of selected toxic (Cd, Pb and Ni), essential (Cr, Cu, Fe, Mn and Zn) and trace elements (Na, K, Ca and Mg) in the edible tissues of three mussel species were also studied: the black Mediterranean mussel *Mytilus galloprovincialis*, and two species of white sand mussels *Chamelea gallina* and *Donax trunculus*. Human risk assessment was performed by calculating target hazard ratios, hazard index and target risk. The calculated safety indices for the individual elements for the combined metals were lower than 1, indicating that the consumption of these freshwater fish species and the investigated bivalves is safe for human health. The content of the trace elements As, Cd, Cr, Cu, Fe, Ni, Pb and Zn and the fatty acid composition in edible tissue of naturally inhabiting populations and cultivated mussels of the species *Mytilus galloprovincialis* grown in the northern part of the Bulgarian Black Sea water area were investigated. The benefit/risk ratio illustrates that both populations are safe and yet beneficial for human consumption, and the health risks associated with bivalve consumption are minimal based on the calculated non-carcinogenic risk indices, hazard index and carcinogenic risk factor. The white clam *Chamelea gallina* was also found to contain higher amounts of flavonoids, vitamins - A, D3, E and K, total alkaloids, carotenoids and phenols and omega-3 polyunsaturated fatty acids. The high levels of DHA, EPA and DPA omega - PUFAs in the edible tissue of the clam also suggest its anti-inflammatory potential.

In an *in vivo* study, the effect of *Chamelea gallina* lyophilisate supplementation on body weight and some biochemical parameters in rats fed a high-fructose diet (HFD) was investigated. The results show a significant decrease in body weight from the intake of mussel lyophilisate, as well as a statistically significant increase in total non-esterified (free) fatty acids in the HFD group, and a reduction in their levels in the groups supplemented with mussel lyophilisate compared to the control. It was also found that supplementation with mussel lyophilisate contributed to reduced levels of serum triglycerides, reduced levels of the pro-inflammatory marker TNF- α , which in parallel with indicators of oxidative stress demonstrate its functionality and its protective effect in cardiovascular pathologies.

On the basis of her intensive research activities, assoc. prof. Merdzhanova formulated the following most important contributions, which I fully accept:

- New data were obtained on the quality of a large number of marine and freshwater organisms traditionally consumed in Bulgaria - chemical composition, fatty acid profile, as well as content of fat-soluble vitamins and pigments.

- Important fatty acid ratios (PUFAs/SFAs; omega-6/omega-3) and indices (atherogenic (AI) and thrombogenic (TI)) characterizing the quality of lipids as food were calculated. The obtained data can be used to enrich databases on the chemical composition of some of the most frequently consumed types of fish and mollusks in Bulgaria.

- The positive effect of mussel lyophilisate from the white mussel *Chamelea gallina* with the potential for application in cardiovascular pathologies has been studied and proven.

- Monitoring studies have been conducted covering a large number of species over a long period of time. The obtained results contribute to the updating of the pollution data of the Bulgarian water area of the Black Sea.

A large part of assoc. prof. Merdzhanova's research contributions are of a fundamental nature, but with great applied potential in the field of functional and dietary nutrition and ecology. The obtained information about the presence of specific biologically active compounds could find applications in the development of medicinal products or nutritional supplements of marine origin. The presented data on the changes in the lipid composition during heat treatment could be used to evaluate the nutritional value of Black Sea fish and mollusks. In addition, fish and mollusks can be used as indicator organisms and the content of toxic pollutants in them can be used to characterize the degree of pollution both in the Black Sea and in other sea and river basins.

It should be emphasized that the research in which assoc. prof. Merdzhanova participates is extremely topical and corresponds to the priorities of some national strategic documents such as: "The National Strategy for the Development of Scientific Research in the Republic of Bulgaria 2017-2030"; "The multi-year national strategic plan for marine resources and aquaculture 2021-2027" and fall under priority direction 3 "Industry for healthy living and biotechnology" of the Innovation Strategy for Smart Specialization of the Republic of Bulgaria. In addition, the topic corresponds very well to priorities 1 "Health" and 6 "Food, Bioeconomy, Natural Resources, Agriculture & Environment" of the Horizon Europe programme.

The relevance of assoc. prof. Merdzhanova's research is also supported by the high total impact factor of the articles she presents at the competition (IF – 37.9). It makes a very good impression that it is twice as high compared to that of the articles used in the procedure for the academic position "associate professor", which is indicative of a scientific growth and an increase in the quality of her scientific production.

4. Evaluation of the candidate's personal contribution

All scientific publications presented in the competition are co-authored, but the fact that in four of the studies presented for the competition assoc. prof. Merdzhanova is the first, and in six she is a corresponding author, leaves no doubt about her personal contribution and leading role in their development and publication.

5. Critical comments and recommendations

I have no significant remarks to the teaching-pedagogical and scientific-research activities of assoc. prof. Merdzhanova. The documents on the competition are presented and arranged very well, which greatly facilitates their analysis. A very good impression is made by the fact that the contribution reference is prepared in a short and concise manner, but at the same time, it is meaningful.

6. Personal impressions

I know Prof. Albena Merdzhanova vaguely from our joint participation in several scientific forums and the short creative discussions during these forums. For this reason, I have no significant personal impressions of her and her work.

CONCLUSION

The documents and materials presented by the only candidate in the competition, assoc. prof. Dr. Albena Merdzhanova, meet all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its Implementation and the specific requirements of the MU-Varna under this competition. She has submitted a sufficient number of scientific papers, beyond those used in the procedures for awarding PhD degree and for acquiring the academic position "associate professor". They contain original scientific and applied contributions to the elucidation of the lipid profile, composition, safety and biological activity of black sea and freshwater organisms used as food. After a thorough review and analysis of the materials presented in the competition about the educational, pedagogical and research activities of assoc. prof. Albena Merdzhanova, I can conclude that she is a very active and dedicated teacher with an affinity for research work and an unceasing desire for improvement and advancement of her qualification.

Due to all of the above, with complete conviction I give my positive assessment and recommend the Scientific Jury to prepare a report-proposal to the faculty council of the Faculty of Pharmacy at the Medical University "Prof. Dr. Paraskev Stoyanov" - Varna for the election of assoc. prof. Dr. Albena Merdzhanova to the academic position "Professor", in the field of higher education 4. "Natural Sciences, Mathematics and Informatics", professional direction 4.2. "Chemical Sciences", the scientific specialty "Chemistry", for the needs of the "Chemistry" department.

17.05.2024

Reviewer:
prof. Petko Denev, PhD

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