

REVIEW

By Professor DSc Veselina Georgieva Gadjeva Medical Faculty, Trakia University, Stara Zagora at the competition for the academic position “Professor” in the Institute of Organic Chemistry, with Centre of Phytochemistry (IOCCP), BAS.

Field of Higher Education 4. “Natural Sciences, Mathematics and Informatics”, professional field 4.2. “Chemical Sciences”, scientific specialty: “Bioorganic chemistry, the chemistry of natural and physiologically active substances”, for the needs of the Laboratory Biologically Active Substances (LBAS) – Plovdiv, announced in State Journal, issue 43/31.05.2019 and on the website of IOFCF, BAS

Candidate: Associate Professor Dr. Petko Nedyalkov Denev, LBAS - Plovdiv, IOCCF-BAS.

1. General presentation of the materials received for review

The competition for the occupation of the academic position “Professor” and the procedure for its holding is based on the Law for the Development of Academic Staff in the Republic of Bulgaria; the Regulations for the Implementation of the Law on the Development of the Academic Staff of the Republic of Bulgaria and Regulations on the terms and conditions for acquisition of academic degrees and occupation of academic positions at IOCCF-BAS, 2019. I have received the necessary documents and materials according to Art. 37 of the Regulations for the Development of the Academic Staff at IOCCF-BAS. The terms and conditions of the procedure for acquiring an academic position “Professor” are respected and complied with the normative documents. In the competition involved a single candidate Associate Professor Dr. Petko Nedyalkov Denev, associate professor in LBAS – Plovdiv, IOCCP BAS.

Presented by Assoc. Prof. Petko Denev set of materials is **in accordance** with the Rules for the development of the academic staff IOCCP BAS and fulfills the criteria for occupying the academic position of “professor”. The applicant has applied:

Reference to a total of 31 scientific papers with which he applied for the competition, distributed as follows: 1. Publications with Impact Factor: 22. (Total Impact Factor - 52.39), distributed by quartiles according to SJR: Q1 -10, Q2 -4 and Q4 -8; 2. Publications without impact factor - 5; 3. Useful model - 1; 4. Chapters from collective monographs – 3. The first author and/or correspondent author is in 10 publications.

List of 31 participation in scientific forums, most of them national and international. In 11 of them is a lecturer or invited lecturer.

Quotation excerpt from Scopus as of July 19, 2019, includes 531 citations of 34 articles published in the period 2010 - 2019; h index - 12.

List of participation in research projects: 1. Projects-19 funded by national sources, he is a scientific supervisor of two of them financed from Science Fund of the Ministry of Education and Science; Coordinator of the IOCCP BAS in two projects financed by the Science Fund of the

Ministry of Education and Science and Scientific advisor in 2 projects, from the program for supporting young scientists at BAS; Participant in 3 projects funded by Bulgarian private companies; 2. Projects funded by EU Operational Programs, including 1 as a Head; 3. Projects developed within the framework of inter-academic treaties and agreements - 3 as a leader.

2. Brief biographical data for the applicant

The only candidate in the competition Assoc. Prof. Dr. Petko Nedyalkov Denev was born on 10.06.1981. He graduated in 2003: Higher Institute of Chemical Technology - now UCTM Sofia, Bachelor of Science in “Biotechnology” and 2005 the University of Food Technology - Plovdiv, Master's Degree in “Biotechnology”. During the period October 2003 - November 2007 he worked as a Chemist at the Institute of Organic Chemistry with the Center of Phytochemistry - BAS, Laboratory for Biologically Active Substances (LBAS) - Plovdiv. From December 2007 to September 2014, he held alternately academic positions: Assistant and Assistant Professor at the Institute of Organic Chemistry with Center of Phytochemistry – BAS, LBAS - Plovdiv.

Habilitated in October 2014 and held the academic position Associate Professor at the Institute of Organic Chemistry with the Center for Phytochemistry - BAS, LBAS –Plovdiv. As head of LBAS –Plovdiv, he continues his scientific work on topics on which the laboratory has established traditions. Assoc. Prof. Dr. Petko Nedyalkov Denev has contributed to increasing the credibility of Laboratory for Biologically Active Substances Plovdiv and establishing LBAS as a leading scientific unit in functional foods.

During his academic growth, Assoc. Prof. Petko Denev has been constantly improved his qualification. He has conducted specializations in universities and laboratories worldwide: 1. Belgium, Technical University KaHo Sint Lieven, 3 months, 2005. 2. Romania, Bucharest, Center for biosensing and biodynamics: Advanced course in biosensors. May 17 – June 2, 2006. 3. The Czech Republic, Czech Academy of Sciences, Institute of Biophysics, Laboratory for Pathophysiology of Free Radicals - 3 months (2006) and 2 months (2007). 4. Slovenia, Maribor, University of Maribor, Laboratory for Separation Processes and Product Design, 1 month, 2012. Under the project BG051PO001/3.3-05-0001 “Science and Business” from Operational Program "Human Resources Development" – “Selection of post-doctoral students and young scientists for a one-month training in high-tech scientific complexes and infrastructures”.

Proof of the high quality of the scientific developments of Assoc. Prof. Petko Denev is the prestigious scientific awards that were awarded to him: The Pythagoras Grand Prize for Young Scientist awarded by the Ministry of Education and Science - 2013; Young Scientist Award “Prof. Marin Drinov” in the field “Biomedicine and quality of life”, awarded by BAS-2013.

Member of scientific organizations: Regional Union of Scientific and Technical Union - Plovdiv; The Bulgarian Phytochemical Association and the Union of Chemists in Bulgaria.

The scientific interests of Assoc. Prof. Petko Denev is related to the extraction and analysis of biologically active substances of plant origin and determination of their biological activity. His professional experience and competence in this field have led to his involvement in several of expert committees: 1. Member of evaluation panel “Natural Sciences” under the COST program (The European Cooperation in Science and Technology) during the 2019 - 2020; 2. Expert evaluator of project proposals under Eurostars program, co-financed by EUREKA and Horizon 2020, 2015, 2016, 2017; 3. Expert evaluator of projects on program Horizon 2020: TWINNING procedure: remote and central evaluation in Brussels, 2015; 4. Expert evaluator of projects at the Research Fund, 2016, 2017, 2018, 2019; 5. Expert evaluator for projects under the Science Foundation of the UHT - Plovdiv, 2017, 2019.

3. General characteristics of the applicant's activities

Evaluation of the Scientific and scientific- applied activity

After acquiring the academic position Associate professor, Petko Denev's research activity is directed to studies in the theoretical and methodological aspect of the condition and tendencies in the extraction and analysis of biologically active substances from medicinal and economically important plants.

Exploring the possibility of counteracting the risk factors of age-related diseases such as atherosclerosis arising in the aging process through the use of natural products is also part of his research. It is in line with the priorities of the Innovation Strategy for Intelligent Specialization 2014-2020 (ISIS): “Industry for Healthy Life and Biotechnology”, which is why I consider it relevant and significant. To implement this research Assoc. Prof. P. Denev has accumulated a lot of theoretical knowledge, skills, and competences in the field of chemistry and biochemistry. He has done a huge amount of practical work (extraction, purification, isolation, and characterization) with modern instrumental techniques (spectrophotometer, liquid chromatograph, fluorimeter, etc.).

Assessment of compliance with the minimum national scientometric indicators for the academic position “Professor”

The scientific production of Assoc. Prof. Dr. Petko Denev is presented according to the requirements of Art. 37 of the Regulations for the Development of the Academic Staff at IOCCF-BAS. Apply in competition for Professor with a total of 31 scientific papers in which: with Impact Factor: 22 pcs. (Total Impact Factor - 52.39), distributed by quartiles according to SJR: Q1 -10pcs, Q2 -4pcs and Q4 -8 pcs; without impact factor – 5 pcs; Useful model - 1; Chapters from collective monographs – 3 pcs. The first author and/or correspondent author is in 10 publications.

Monograph or equivalent publications:

Assoc. Prof. Petko Denev participates in the competition with an equivalent number of articles for habilitation work -8 pcs (presented in a separate list) in publications referenced and indexed by Web of Science and Scopus, all with impact factor: Q1-3 pcs; Q2 -3 pcs and Q4-2 pcs, which earns him 159 points for a group of indicators B (according to Appendix 1 of the Rules for the conditions and procedure for acquiring scientific degrees and for occupying academic positions at the Institute of Organic Chemistry with the Center for Phytochemistry, BAS).

Publications, chapters of collective monographs and utility models, which Assoc. Prof. Petko Denev presented in group of indicators D (according to Appendix 1 of the Rules for the conditions and procedures for acquiring scientific degrees and for occupying academic positions at the Institute of Organic Chemistry with the Center of Phytochemistry, BAS) bring him 337 points. These are 14 scientific publications in journals that have been referenced and indexed in Web of Science and Scopus, all with an impact factor: Q1-7 pcs; Q2 -1 pcs; and Q4-6 pcs; Published chapter of a collective monograph - 3 pcs; Recognized utility model request - 1 pcs.

Citation in national and foreign literature

Associate Professor Petko Denev provides evidence for a total of 531 citations (excluding self-citations) of works in scientific journals, reflected in the Web of Science and Scopus databases for 2015-2019, which carry him 1062 points for group E (according to Annex 1 of the Rules on the Terms and Conditions for Acquisition of Scientific Degrees and Occupation of Academic Positions at the Institute of Organic Chemistry with the Center for Phytochemistry, BAS).

Participation in a national scientific or educational project:

Assoc. Prof. Petko Denev has participated in 19 projects funded by national sources and by EU Operational Programs, which bring him 190 points. He is the head of 6 of them, which brings him 120 points; For attracted funds under projects managed by the applicant worth 105757 receives 21.2 points or a total of 331 points for a group of indicators E (according to Appendix 1 of the Rules for the conditions for the acquisition of academic degrees and for occupation of academic positions at the Institute of Organic Chemistry with the Center of Phytochemistry, BAS).

From the provided Reference -Sample on the criteria for the academic position "Professor" and presented evidence can be seen, that Assoc. Prof. Petko Denev in the number of

points exceeds significantly required by the Institute of Organic Chemistry with the Center for Phytochemistry, BAS.

4. Scientific Contributions

The scientific contributions from the works of Assoc. Prof. Petko Denev has a fundamental and applied character and can be summarized in the following directions: 1. Investigation of the chemical composition and biological activity of medicinal and economically important plants: 1.1. Investigation of the chemical composition and biological activity of *Aronia melanocarpa* fruits and functional foods; 1.2. Investigation of the chemical composition and biological activity of other medicinal and economically important plants; 2. Utilization of waste from the essential oil industry to obtain new products; 3. Study of the chemical composition and biological activity of pectic polysaccharides.

Works from the first direction presented the study results of the chemical composition and biological activity of chokeberry fruits (*Aronia melanocarpa*) and other medicinal plants and commercially available nutritional supplements. Studies have been carried out not only on nutritional value but also with some health effects. The following important points can be drawn:

- It has been extended a study of the chemical composition of 23 samples fruits chokeberry from two consecutive harvests - 2016 and 2017; and was found: *Aronia* samples differ significantly in both in content and organic acid composition, and the differences exceed 100%. Was investigated the antioxidant, antimicrobial, and neutrophil -modulated activity of *Aronia* polyphenol fractions and was found, that quercetin and epicatechin are the strongest antioxidants among *Aronia* polyphenols. Eight herbal extracts were tested for their co-pigmentation ability with *aronia* anthocyanins, resulting in a significant hyperchromic effect at much lower co-pigment/pigment ratios, compared to pure compounds and opens the possibility to develop functional chokeberry foods with improved sensory properties and biological effects. In collaboration with teams from the Medical University-Plovdiv, in in vitro and in vivo experiments have been investigated the effect of functional chokeberry drinks on various somatometric, lipid and histopathological parameters in experimental animals, and was found, that *aronia* -treated animals show lower atherogenic risk and cardioprotective indicators of the cardiovascular system.
- The phytochemical composition and biological activity of nearly 80 Bulgarian fruits, vegetables and herbs were studied. I give high marks of presented own results for flavonoid content (flavan-3ols, flavonols, and flavones) of selected fruits and vegetables, and the correlation with their ORAC antioxidant activity in the Collective Monograph Chapter published in the prestigious Elsevier Handbook of Food Bioengineering. The

results of a plants study which are less commonly used in the food industry are of great interest. They can be used to develop new nutritional supplements: *Chaenomeles maulei* (Japanese quince, mountain lemon) showing that it can be a natural acidifying agent; Pepper (*Capsicum annum*) from the Balkan region, characterized by the chemical composition and antioxidant activity of 63 genotypes, varieties, native forms and F1 pepper hybrids; *Stevia* (*Stevia rebaudiana*): it was determined the content of steviol-glycosides in 24 genotypes of stevia cultivated in Bulgaria. It has been made a conclusion, that it is possible, through the path of individual selection and in the climatic conditions of Bulgaria, to develop genotypes of stevia with a high content of steviol-glycosides; Quinoa (*Chenopodium quinoa*): the chemical composition, nutritional value, amino acid and fatty acid composition of selected quinoa genotypes were studied, and is concluded, that quinoa seeds from the new Egyptian genotypes are good source of essential nutrients such as minerals, essential amino acids, and essential fatty acids.

The second line of works included more important results obtained concerning the utilization of waste from the essential oil industry to obtain new products. Research in this area has been done mainly within the framework of a project “Recovery and application of waste materials from the essential oil industry for “green” synthesis of metal nanoparticles“, whose coordinator for IOCCF-BAS was Assoc. Prof. Denev. The contribution to these studies is essentially that the extracts obtained from waste biomass from the essential oil industry: waste of extracts from Rose oil (*Rosa damascena*), Calendula (*Calendula officinallis*), Lavandula (*Lavandula angustifolia*), and Lemon balm (*Melissa officinalis*) increase the bread expiry date (Shelf Life). Particularly interesting is the study on the synthesis of nanoparticles using *Rosa damascena* waste extracts and their application for the electrochemical reading of hydrogen peroxide and vanillin.

The works included in the third strand are related to the first-time characterization of the polysaccharide composition in 11 European and in particular Bulgarian medicinal plants. It has been found, that prolonged hot water extraction is a reliable way to obtain pectin –rich polysaccharide complexes with high in vitro complement fixation activity and high ex vivo intestinal immunomodulatory effect. For the first time is isolated from the *Tilia* blossom a unique pectin polysaccharide with anti-inflammatory potential. The structure and immunomodulatory activity of water-extractable pectin polysaccharides from lavender has been studied for the first time.

Implementation activities

I appreciate highly the technological advances made to synergistically increase the antioxidant activity of chokeberry drinks by adding an extract obtained by the homogenization of rosehips. The results are of real practical application and are protected by Useful Model No. BG2031 / 01.04.2015.

5. Assessment of the applicant's contribution

I believe that the formulated contributions and the obtained results are to a great extent a personal credit of Assoc. Prof. Petko Denev. The reason for this is the fact that he is the first author and/or author of correspondence in 10 publications. He is the manager of 6 projects funded by National Programs and EU Operational Programs. Under his guidance, large-scale studies of the chemical composition and biological activity of samples from the studied medicinal and economically important plants have been carried out under the projects.

The high citation of publications is also an indicator with a significant personal contribution.

6. Critical comments and recommendations

I have remarks regarding the teaching activity of Assoc. Prof. Petko Denev, which I consider insufficient, although it is not required according to the criteria for occupying the academic position “Professor” in the Regulations for the Development of Academic Staff of IOCCF-BAS. Given the professional experience and competence of Assoc. Prof. Denev, I am convinced that he will be useful as a lecturer for any University. I recommend enrolling him as a University Lecturer in Bachelor, Master and Ph.D. students.

7. Personal impressions

I know Assoc. Prof. Petko Denev from our joint work on Project DN 19/14 of National Science Fund “A comprehensive approach to assessing changes in biologically active substances and the antioxidant potential of irradiated plant foods and herbs. New gamma-ray protectors” (12.2017-06.2021). During the last period from project start, he actively and effectively collaborates with participants from different institutions and a large part of the planned joint experimental work has been implemented.

I believe that with his professional experience and competence Prof. Petko Denev contributes to increasing the authority of LBAS in the field of functional foods at national and international level.

CONCLUSION

Documents and materials presented by the sole candidate Associate Professor Petko Nedyalkov Denev in the competition **meet all the requirements** of the Law on Development of the Academic Staff in the Republic of Bulgaria; the Regulations for the Implementation of the

Law on the Development of the Academic Staff of the Republic of Bulgaria; Regulations Rules for the Development of the Academic Staff at BAS and IOCCF-BAS Regulations.

Regarding scientific activity: Associate Professor Dr. Petko Nedyalkov Denev presented a sufficient number of scientific papers published after the materials used in the defense of the Ph.D. and the academic position "Associate Professor". Shows great scientific activity, as submitted publications exceed the national requirements; exceed the requirements and the number of citations, which shows that the results of the research published by the author have been evaluated and recognized internationally. The achieved results by the applicant in the research activity **fully comply** with the specific requirements of the Implementing Regulations of the Law on Development of the Academic Staff in the Republic of Bulgaria and regulations of IOCCP -BAS.

The applicant's works have original scientific and applied contributions, which have received international recognition, as a representative part of them and have been published in journals and scientific collections, published by international academic publishers. His theoretical developments have practical applicability.

In terms of professional development Assoc. Prof. Petko Denev has impressive professional experience and unquestionable scientific qualification. He is a scientist with advanced analytical techniques; actively collaborates with researchers from various institutions and universities in Bulgaria and abroad.

After getting acquainted with the materials and scientific works presented in the competition, analyzing their importance and their scientific and applied contributions, I find it reasonable to give my positive assessment and to recommend to the Scientific Jury to prepare a report proposal to the Scientific Board of IOCCP -BAS for the selection of Associate Professor Dr. Petko Nedyalkov Denev at the academic position of "Professor" at IOCCF-BAS professional field 4.2 Chemistry of the scientific specialty "Organic Chemistry and Chemistry of Natural and Physiologically Active Substances".

09.09. 2019 г.

Reviewer:

(Prof. DSc Veselina Georgieva Gadjeva)