REVIEW

By Dr. Iliyan Ivanov Ivanov, professor, PU"P. Hilendarski"

of the materials submitted for participation in the competition
to occupy the academic position of "**associate professor**"
at Paisii Hilendarski University of Plovdiv

by: field of higher education *4.Natural sciences, mathematics and informatics*

professional direction *4.2. Chemical sciences (Organic chemistry technologies, Food chemistry)*

In the competition for "associate professor", announced in the State Gazette, no. 39 of May the 02nd, 2023 and on the website of the Paisiy Hilendarski University of Plovdiv for the needs of the Department of Chemical Technology at the Faculty of Chemistry, as a candidate Chief Assistant Professor Zhana Yulianova Petkova, the same University.

A general overview of the received materials

By order No. РД 21-1426 of June 30, 2023 of the Rector of Paisii Hilendarski University of Plovdiv, I have been appointed as a member of the scientific jury of a competition for the academic position of associate professor at Paisii Hilendarski University of Plovdiv in the field of higher education 4. Natural sciences, mathematics and informatics, professional direction 4.2 Chemical sciences (Organic chemical technology, Food chemistry), announced for the needs of the Department of Chemical Technology at the Faculty of Chemistry. With the decision of the scientific jury (protocol No. 1 of 07.07.2023), I am appointed to prepare a review of the competition.

Only one candidate submitted documents for consideration in the declared competition: Chief Assistant Professor Zhana Yulianova Petrova of Paisii Hilendarski University of Plovdiv.

The presented by Chief Assistant Professor Zhana Yulianova Petkova, a set of paper materials is in full compliance with the Rules for the Development of the Academic Staff of the Plovdiv University, and includes the following documents:

- Application form to the rector for admission to participate in the competition;
- Autobiography;
- Diplomas for higher education with acquired educational and qualification degree "bachelor" and "master" - original with appendix;
- Diploma for educational and scientific degree "doctor" - original;
- List of scientific works (copies of publications);
- List of citations (2015 – 2022);
- Certificate of compliance with the minimum national requirements by professional direction 4.2. Chemical Sciences;
- Annotations of the materials under Art. 65. from PRASPU (in Bulgarian and English) with extended habilitation certificate;
- Self-assessment of contributions;
- Declaration of originality and authenticity of the attached documents;
- Certificate of work experience;
- Documents for academic work;
- Documents for research work;
- Certificate of compliance with the minimum additional requirements of the Faculty of Chemistry at Paisiy Hilendarski University of Plovdiv;
- Other documents.

The candidate, Dr. Zhana Petkova, has submitted a total of eighteen scientific papers, one textbook and a list of ten participations in scientific research projects. Eighteen scientific works are accepted for review, which are outside the dissertation for the Doctor of Education and Science degree and are counted in the final evaluation, one teaching aid, ten participations in scientific research projects and one participation in an educational project. The distribution of scientific works by relevant headings, in the country and abroad, is as follows: Q1 – eight, Q2 – six, Q3 – two, Q4 – two. Six of the publications are presented as a habilitation thesis (122 points, respectively from three publications in issues Q1 and one each Q2, Q3, Q4) and twelve in section Г of the reference (250 points, respectively from five publications in issues Q1, five in Q2, one in Q3 and one Q4 without IF). Total Impact factor 40.04

The noted citations of the presented scientific works in the competition at the time of submission of the documents are 90, of which 70 are in the Scopus/Wos database. The total number of citations observed on all scientific communications is 232 (162 in Scopus/WoS, Hirsch index 7).

With the indicated indicators, presented by Ch. Assistant Dr. Petkova, materials fully meet and significantly exceed the scientometric criteria laid down in the *Minimum National Requirements for the scientific, teaching and/or artistic or sports activities of the candidates for* ..... according to the Law on the development of the academic staff in the Republic of Bulgaria (LDASRB).

a group of indicators	content	Associate professor	performance
A	indicator 1	50	50
B	Indicator 3 and 4	100	122
Г	indicator 7	200	250
Д	sum of points in indicator 11	50	324

Biographical data of the candidate

Zhana Petkova was born in the city of Plovdiv on August 18, 1986. In 2009, she graduated with honors from a four-year study course at the University of Food Technology - Plovdiv, Bachelor of Science, specialty "Technology of fats, essential oils, perfumery and cosmetics" - engineer. In 2010, she obtained a master's degree at the same university, again with excellent results, majoring in "Technology of fats, essential oils, perfumery and cosmetics". After a successful full-time doctoral studies (2012-2015) in the Department of Chemical Technology, in 2015 she defended her dissertation in the doctoral program "Technology of animal and vegetable fats, soaps, essential oils and perfumery-cosmetic preparations" on the topic: "Investigation of the composition of the biologically active components in the seeds of fruits from the family *Cucurbitaceae* and their potential application in food and cosmetic products", under the scientific supervision of Prof. Dr. G. Antova.

Eng. Dr. Zh. Petkova began her academic career in 2015 as an assistant in the Department of Chemical Technology, and since 2016 she has held the academic position of chief assistant in the same department. In the period after acquiring her doctor's degree, Ch. Assist. Professor Petkova continues to develop her research activity in the field of research related to establishing the chemical, in particular the lipid composition of various plant species - from traditional farm crops to non-conventional ones. Study of the possibilities of increasing the oxidant stability of glyceride oils, study of changes in the lipid composition and physicochemical characteristics of lipid products subjected to heat treatment and long-term storage.

General characteristics of the applicant's activity

Assessment of educational and pedagogical activity

According to the documents presented for the competition, Dr. Zhana Petkova's teaching activity plays a key role in her professional realization (on average 167% implementation with a norm of 360 hours). It is clear from the references given that she spends a significant amount of her

time working with students at both the bachelor's and master's level of higher education. The candidate's primary areas of instructional and instructive endeavors are connected to her scientific studies in the fields of food chemistry and organic chemical technology. She participates in a variety of elective subjects in addition to the required courses.

Dr. Zh. Petkova's auditor duties include teaching lecture courses, seminars, laboratory exercises, and assigning students independent work. Leads the lecture courses "Materials for Medicine" and EC "Food Additives" for Bachelor students, as well as "Chemistry of Food Additives" EC "Chemistry of Food Additives and Contaminants" and EC "Functional Foods" in Master's program Food Chemistry.

During the period, she led practical classes - seminars, laboratory exercises and practicums for Bachelors with students from the Faculties of Chemistry and Biology in the disciplines: "Organic Chemical Technology", "Production Practice OHT", "High Molecular Compounds", "Research Practice", " Chemistry of polymers", "Applied organic chemistry", "Materials for medicine", "Technology of medicinal products", "Food and food hygiene", "Technology of dosage forms", "Bioorganic chemistry", "Industrial organic chemistry" , "Food Chemistry", "Food Analysis", "Food Supplements". In the Master's program "Food Chemistry" in different periods, Dr. Petkova is the leader of laboratory exercises in the disciplines "Chemistry of food products - 1 part", "Food Chemistry" "Chemistry of food additives", "Methods for the analysis of foods", as well as Scientific research practice 1 and 2 part.

The candidate has six scientific guides of bachelor's degree graduates - three successfully defended and three in the process of preparing theses.

Chief Assistant Dr. Zh. Petkova is the co-author of a teaching aid - "Guide for Laboratory Exercises in Food Chemistry", intended for Master's degree students in the specialty "Food Chemistry", Bachelor's degree students in the specialty "Chemical Analysis and Control of quality", as well as specialists from various scientific fields.

Evaluation of the candidate's scientific and scientific-applied activity

The materials presented by Dr. Petkova for participation in the competition demonstrate intensive and fruitful scientific and scientific-applied activity in one of the priority scientific areas according to the National Strategy for the Development of Scientific Research in the Republic of Bulgaria. Scientific research is related to the complex evaluation of the chemical and lipid composition of a number of traditional agricultural and non-conventional plant crops. Study of the possibilities of increasing the oxidant stability of glyceride oils, study of changes in the lipid composition and physicochemical characteristics of lipid products during long-term storage or subjected to thermal effects.

The publication of the results of scientific research in renowned journals (eight of the scientific publications are in scientific publications falling in Q1 and six in Q2) is more than indicative, both of the relevance of the conducted research, and also of the quality of the achieved results. In addition to the quality of the candidate's research work, the intensity of the research and its dissemination among the scientific community is also noteworthy. An excellent impression is made by the achieved high citation rate of the reported results in the relatively short period after their announcement. The latter is another objective proof of the quality and relevance of the candidate's scientific research.

Given the nature of Dr. Zh. Petkova's research, teamwork and a lack of independent scientific publications are totally understandable. I consider as a particularly positive fact the candidate's collaboration and team work in research groups including scientists, both from scientific institutions from Bulgaria and also from abroad (USA, Turkey, Czech Republic, Morocco, Saudi Arabia, Egypt, India, Malaysia). Of the eighteen publications presented in the competition, in five the candidate is the first and corresponding author (Q2 – twice, in Q3 – once and Q4 – twice).

The results of the candidate's research activity have been popularized among the scientific community through a series of participations in authoritative scientific forums in our country (six reports and thirty-five posters) and abroad (three posters).

Part of the scientific results were achieved through participation in ten successfully implemented scientific and scientific-applied research projects directly related to Dr. Petkova's scientific interests. The implemented projects are both at the university level (PU, UHT), as well as at the national (MES) and international level (USA, Global Enterprise Technologies Corp.). One project is related to student training funded under the EU Operational Program "Science and Education for Smart Growth".

Acknowledgment of Dr. Petkova's authority among the scientific community is the peer review activity for renowned scientific journals (over twenty in the period 2019-2022).

Contributions (scientific, scientific-applied, applied) and citations

The scientific researches of Dr. Zh. Petkova are developing in one of the main scientific directions developed in the Department of Chemical technology, namely the study of the chemical and lipid composition of both traditional and unconventional plant species of economic importance. The possibilities of increasing the oxidant stability of glyceride oils were studied, the changes in the lipid composition and physicochemical characteristics during heat treatment and long-term storage of lipid products were studied. In particular, objects of animal origin are also included in the research.

The main scientific and scientific-applied contributions in the presented scientific publications equivalent to habilitation work include enrichment of existing knowledge and disclosure of new facts related to establishing the chemical and lipid composition of non-traditional food sources such as: unripe seeds of black pine (Pinus nigra Arn.) , ripe and unripe corms of juniper (Juniperus excelsa M. Bieb), seeds of various types of tobacco (Nicotiana alata Link & Otto, N. rustica and N. tabacum), seeds of lupine (Lupinus angustifolius L. cultivar "Boregine") and fruits of physalis (Physalis peruviana L.) and laurel (Laurus nobilis). In the course of the studies, modern methods and methodologies for sample preparation and analysis, adapted to the respective objects, were used. As a result of conducted research, the fatty acid and tocopherol composition of glyceride oil obtained from unripe black pine seeds was determined. The content of carbohydrates, cellulose, proteins and amino acid composition, total ash content and mineral composition were determined in the remaining meal. The established chemical composition and content of biologically active substances highlight the potential for application in various fields.

A comparative analysis of ripe and unripe cones of Juniper from three different habitats was carried out. The content of proteins, chlorophyll, carotenoids, essential and glyceride oil was determined. The individual fatty acid, tocopherol and sterol composition in the lipid fraction was determined. The total phenolic and flavonoid contents were determined, and the antioxidant activity of galbuli extracts was determined by DPPH, ABTS, FRAP and CUPRAC. The obtained results demonstrate the differences in phytochemical composition and antioxidant activity as a function of maturity and habitat.

For the first time, the content and composition of biologically active substances in seeds of experimentally grown three types of tobacco - *Nicotiana alata* Link&Otto, *N. Rustica*, and *N. tabacum* - was investigated. The seeds were found to be rich in glyceride oil, and the content of sterols, tocopherols and fatty acids was determined. In view of the full utilization of the seeds, an assessment was also made of the content of various macro- and micronutrients in the waste meal. The established relatively low content of ingredients important for feed (lysine, methionine and cysteine), suggests its application in a suitable combination with other nutritional ingredients in feed mixtures.

For the first time, detailed studies were conducted on the chemical and lipid composition of seeds of *Lupinus angustifolius* L. (narrow-leaved, blue lupine) of the German variety "Boregine",

harvested in Bulgaria. Physicochemical characteristics of the glyceride oil were determined - peroxide, acid, iodine and saponification number, relative density at 20°C, refractive index and oxidant stability. The chemical composition of the seeds was determined, including the content of proteins, glyceride oil, carbohydrates (including starch, water-soluble sugars and fiber), moisture, and the energy value was calculated. The amino acid composition and the main mono- and disaccharides in lupine seeds were determined. The total content and the individual composition of the fat-soluble biologically active compounds - sterols, tocopherols, carotenoids, chlorophyll, phospholipids - were determined. The fatty acid composition of triacylglycerols and the main classes of phospholipids was determined. Based on the obtained results, it was concluded that the seeds of the "Boregine" variety are a promising industrial crop. Glyceride oil is a potential alternative source of high-quality lipids with nutritional value and a long shelf life (extremely high oxidative stability).

A detailed study of the lipid composition of seeds, fruit coat and their residue of physalis (*Physalis peruviana* L.) of Colombian origin, after high-speed vacuum separation, was carried out. Their oil content, the total content of phospholipids, sterols and tocopherols in the oils, as well as their individual composition, were determined. The fatty acid composition of the individual fractions of physalis after the separation of the fruit juice was determined. The obtained results can be a basis for the development of various functional foods and feeds.

Detailed studies were conducted on the chemical and lipid composition of laurel (*Laurus nobilis* L) fruits originating in Greece and Georgia. They have been found to be rich in various valuable compounds and can potentially be used for the needs of the perfumery, cosmetic and pharmaceutical industries.

The results of Dr. Zh. Petkova's scientific research included in the habilitation reference are formed in six scientific publications - three in publications included in Q1 and one each in Q2, Q3 and Q4 (122 points out of the required 100 items according to the Minimum National... ....).

Research related to determining the chemical and lipid composition of various botanical parts of non-traditional plants, with the aim of detailed characterization and establishing the presence of biologically active components, and their application for food, pharmaceutical and other industrial purposes also includes:

- Sorbus (*Sorbus domestica* L.) - fruits. As a result of a detailed study on the main nutrients, secondary metabolites and antioxidant activity of rind berries, it was found that palmitic acid is the main saturated fatty acid, while linoleic acid predominates among the polyunsaturated fatty acids. The sterol fraction consists mainly of *β*-sitosterol. Potassium, iron and boron are the most common macro-, micro- and ultra-micronutrients. Analysis of amino acid composition shows that non-essential amino acids predominate over essential ones;
- Pod (*Physalis alkekengi* L.) - fruit, seeds. The composition of different plant parts from two pod phenotypes - seeds, fruit pulp and husk - was studied. The seeds have been found to contain most of the protein and fiber in the fruit. They are a rich source of glyceride oil, with a yield of up to 17% and a predominant content of unsaturated fatty acids and tocopherols;
- Physalis (*Physalis peruviana* L.) – fruit, fruit shell and seeds. The content of phytonutrients and biologically active substances in different organs of the plant has been extensively studied. A comparative analysis was conducted between the content of glyceride oil in the fruit shell and the seeds of two physalis genotypes of Bulgarian origin (Plovdiv, Mezdra), as well as the fatty acid and tocopherol composition of the oil;
- Carob (*Ceratonia siliqua* L.) - seeds. The composition and biological activity of carob seeds were studied. The content of glyceride oil in the seeds and the main fatty acids – oleic, linoleic and palmitic – as well as the predominant γ-tocopherol were determined. The sterol fraction was found to be dominated by β-sitosterol and stigmasterol. Carob seeds showed the highest antioxidant activity determined by CUPRAC. Mineral composition was also determined, with the macronutrients Ca and Mg being the predominant elements in the seeds;

- Nettle (*Urtica dioica* L.) - seeds. The lipid composition of nettle seeds was studied, important lipid indices were determined, the values of which help to establish the antiatherogenic and antithrombogenic properties of lipids, as well as their hypocholesterolemic potential;

- Burchak (*Vicia ervilia* L.). Burchak seeds have been found to be high in carbohydrates and proteins and extremely low in glyceride oil;

- Adamovo (*Vitex agnus-castus* L.) The lipid composition of the fruits of the plant was determined from samples growing in two regions in Bulgaria - Plovdiv and Varna. The content of proteins, carbohydrates, fiber, ash, essential and glyceride oil was determined. The composition of the essential oils of the fruits from the two regions was determined, and significant differences in the quantitative and qualitative composition of the essential oils were found. The essential oils extracted from plants from North-Eastern Bulgaria show good antimicrobial activity against the pathogens Salmonella ebony, Staphylococcus aureus and Bacillus subtilis. The comparative analysis showed significant differences in the chemical composition (proteins, carbohydrates, ash and moisture) of the fruits from the two habitats, as well as in the content of the main components of their essential and glyceride oils;

- Madia (*Madia sativa* L.). Glyceride oil obtained from madia seeds of three varieties introduced in Bulgaria was characterized in detail;

Researches of various products and raw materials of animal and vegetable origin are of a scientific and applied nature, related to researching the possibilities of increasing the quality and stability of the foods in which they are used.

A comprehensive comparative analysis of the nutritional and energy value of eggs from seven different genotypes of hens was conducted, and small variations in the chemical composition of the yolk and albumen were found. Significant differences were observed in the fatty acid composition of the major phospholipid classes and the triacylglycerol fraction. The obtained data can serve to optimize the diet of birds and increase the quality of food products.

By means of differential scanning calorimetry, the thermal characteristics of the raw materials and finished poultry pâtés enriched with various plant components were determined. The study investigated the effect of factors such as heating/cooling rate and matrix effect on various components in the raw materials and in the pastes. The cooling rate was found to have a significant effect on the melting/crystallization temperature, enthalpy and peak height of the fat crystallization process, and the peak height and enthalpy of the melting process. The content of unsaturated fatty acids is important for both the rate of crystallization and the melting temperature of raw materials and products. The obtained results can be used in the evaluation of the thermal stability of the prepared products and optimization of the thermal treatment in the preparation of pâtés.

A comparative study of the thermal stability of glyceride oils from sunflower, pumpkin and melon seeds under microwave and conventional heating conditions was carried out. The greatest change in fatty acid composition was found to occur during microwave heating at 900 W. Studies have shown that melon seed oil is more thermally stable than pumpkin and sunflower oils. The obtained results may find application in the evaluation of the thermal stability of pumpkin, melon and sunflower seed oils and the potential opportunity to improve their thermal stability.

Noticed citations based on data provided by the applicant at the time of submitting the documents are a total of 232. and include citations in scientific communications, patents, dissertations, books, and series. Of these, 162 are in Scopus and/or WoS databases, and 70 in unreferenced sources. A detailed bibliography of noted citations is provided. The citations related to publications submitted for participation in the competition for associate professor are ninety in total, of which seventy are in publications referenced and indexed in Scopus and/or WoS databases. The average citation rate of the articles in the competition is five, respectively four according to Scopus and/or WoS databases.

h-index : 7

The citation rate is fairly evenly distributed, noting the quick spotting of citations, which is an objective certificate of the quality and relevance of scientific research.

Evaluation of the candidate's personal contribution

The candidate's participation in the conducted research, the obtained results and the formulated scientific and scientific-applied contributions is essential and does not arouse doubt.

Critical remarks and recommendations

I have no significant objections to the materials submitted for participation in the competition, illustrating the research and teaching activities of Chief Assistant Professor Dr. Zh. Petkova. Admitted minor technical inaccuracies do not change the excellent impression.

I wish Dr. Petkova to maintain the intensity and quality of his scientific research. To successfully and fruitfully combine his teaching work with scientific and applied research.

Personal impressions

Познавам кандидата лично. Впечатленията ми от работа на гл. ас. Жана Петкова са за организирана, делова, трудолюбива и последователна личност, притежаваща добра учебно-методическа и професионална подготовка. I know the candidate personally. My impressions of the work of Dr. Zhana Petkova is an organized, business-like, hard-working and consistent person, possessing a good study-methodical and professional training.

CONCLUSION

The documents and materials presented by the only candidate in the competition, Dr. Zhana Yulianova Petkova meets all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria ((LDASRB), the Regulations for the Implementation of LDASRB and the relevant Regulations of PU "Paisiy Hilendarski".

The candidate in the competition has submitted a significant number of scientific works published after the materials used in the defense of the "Doctor" degree and competition for chief assistant. The candidate's works contain original scientific and applied contributions that have received international recognition, all of which, without exception, have been published in renowned journals referenced in WoS and/or SCOPUS. Her theoretical developments have practical applicability. Dr. Zh. Petkova's scientific and teaching qualifications are unquestionable.

The results achieved by Dr. Zhana Petkova in her educational and research activities exceed the minimum national and additional requirements of the Faculty of Chemistry, adopted in connection with the Regulations of the PU for the application of (LDASRB).

After getting acquainted with the materials and scientific works presented in the competition, analyzing their significance and the scientific, scientific-applied and applied contributions contained in them, I find it reasonable to give my positive assessment and to recommend the Scientific Jury to prepare a report-proposal to the Faculty Council of the Faculty of Chemistry for the selection of Chief Assistant Professor , Engineer, Dr. Zhana Yulianova Petkova, to the academic position of "**Associate professor**" at Paisiy Hilendarski University of Plovdiv in: field of higher education 4. Natural sciences, mathematics and informatics professional direction 4.2. Chemical Sciences (Organic Chemical Technology, Food Chemistry)

30 august 2023

Reviewer: .....

Prof. Dr.Iliyan Ivanov