OPINION
from D.Sc. Panteley Petrov Denev
Professor at the University of Food Technology - Plovdiv

of dissertation for the presence at the scientific stage "Doctor of Science"
in the field of higher education 4. Natural sciences, mathematics and informatics
professional field 4.2. Chemical Sciences (Organic Chemistry)
Author: Assoc. Prof. Dr. Petko Ivanov Bozov - PU "Paisii Hilendarski"
Subject: Clerodane diterpenoids of species of the family Lamiaceae

By order № P33-902 of 11.03.2021 of the Rector of Plovdiv University "Paisii Hilendarski" (PU) I was appointed a member of the scientific jury to provide a procedure for the defense of a dissertation on "Clerodane diterpenoids of the Lamiaceae family "for obtaining the scientific degree" Doctor of Science "of the University of Plovdiv in the field of higher education 4. Natural sciences, mathematics and informatics, professional field 4.2. Chemical sciences (Organic chemistry). The author of the dissertation is Assoc. Prof. Dr. Petko Ivanov Bozov from the Department of Biochemistry and Microbiology at the Faculty of Biology of the University of Plovdiv "Paisii Hilendarski".

The set of paper materials presented by Assoc. Prof. Dr. Bozov is in accordance with Art. 45 (4) of the Regulations for development of the academic staff of PU, including documents: application to the Rector of PU for disclosure of procedures for defense of dissertation, CV in European format, copy of diploma for educational and scientific degree "Doctor", protocols from department councils, contact the opening of the procedure and the preliminary discussion of the dissertation, dissertation, abstract (in Bulgarian and English), list of scientific publications on the topic of the dissertation, copy of scientific publications, declaration of originality and authenticity of attached documents, reference for compliance with minimum national requirements.

The dissertation has applied 28 scientific publications, of which 18 in scientific journals, referenced and indexed in world-famous databases with scientific information (ISI Web of Knowledge and / or SCOPUS) distributed as follows: Q1 - 1, Q2 - 8, Q3 - 4 , Q4 - 5.

The relevance of the dissertation is supported by the fact that diterpenes attract the interest of chemists in their intensive research with the great variety of chemical structures, the presence of different functional groups in their molecules and the problems that arise in proving the structure, place of substitutes and stereochemistry of chiral centres. There is also great interest in their diverse biological activity. The different species of the genera *Scutellaria*, *Teucrium*, *Ajuga* and *Salvia* from the Lamiaceae family are a rich source of diterpene compounds with a clerodane skeleton, which are characterized by diverse biological activity - antimicrobial, antifungal, insecticidal, antiulcer, cytotoxic, antipyretic. They are also characterized as powerful antifeedants. *Neo*-clerodanes are natural biodegradable substances, with low environmental impact, potential antifeedants with the possibility of application as an alternative to chemical synthetic and highly toxic pesticides in crop pest control. Plants of this genera are widely used in herbal therapy, as extracts from the roots and their aboveground parts in the form of a decoction are used in folk medicine as an effective remedy against staphylococci, cholera, dysentery, pneumonia and others. They are also used for calming the nervous system in the treatment of hysteria, epilepsy, convulsions and mental illness.

The dissertation is constructed in traditional form with the relevant sections. It is written on 277 standard computer pages, which include 170 pages of text, 16 pages of literature, 23 pages of which describe 383 structural formulas, 33 tables, 137 figures, 23 appendices.

The literature review is prepared purposefully and specifically and includes all aspects of the study. 276 publications are covered, corresponding to each of the set tasks. The detailed literature review, the conclusions made on its basis, the tasks, the achieved scientific and applied results, as well as their interpretation show that the dissertation has in-depth theoretical knowledge in the field of biosynthesis and analysis of biologically active substances and practical skills for setting and solving specific tasks.

The "Materials and Methods" section presents an impressive set of diverse spectral and biological methods tailored to the specific requirements of the experiment. The methodology is presented in an understandable way, allowing for correct isolation, characterization, preparation and analysis of the studied objects, which is a guarantee for obtaining reliable and reproducible results.

The section "Results and discussion" is characterized by the logical sequence of development. The obtained results are presented very clearly and correctly. The discussion was made convincingly on the basis of modern data and against the background of the achievements of other authors.

The scientific work presented by Assoc. Prof. Bozov is a serious study of clerodane diterpenoids with a strong applied and theoretical sound, whose contributions can be defined as scientific and scientific-applied. The main contributions of the research, corresponding to the requirements of the law for essential novelty, are:

• 48 diterpenoids were isolated and spectrally characterized, of which 22 had structures new to science, and another 13 diterpenoids were proved for the first time in the studied species;

• The structure of neoajugapyrine A, reported as 1β-hydroxyscutecyprine to 3β-hydroxyscutecyprine, was corrected. The real structure of 1β-hydroxyscutequiprine, with the trivial name scutegalerin A, was isolated and spectrally characterized.

• Epimeric pairs have been shown in 11 clerodane diterpenoids. In five of them, both isomers are characterized spectrally

• *Neo*-clerodane (scutaltisin C) with the unusual C-11R configuration has been isolated. For the first time, the epimeric mixture of scutecolumnin C (11S configuration) and 11-epi-scutecolumine C (11R configuration), previously published as "inseparable with different solvents and crosslinking mixture in an epimeric ratio of 3: 7", was partially separated.

The data presented in the dissertation are included in 28 scientific publications in journals, referenced and indexed in world-famous databases with scientific information. The total IF is 14,921. Assoc. Prof. Bozov declared that the works were cited 141 times. From the SCOPUS database it can be seen that the h-index of Assoc. Prof. Bozov is 5 (without auto-citations). The presented scientometric data meet the requirements of the Regulations for application of the RASRB. I declare that I have not found any evidence of plagiarism. The topicality, as well as the theoretical and applied value of the development are categorical. Assoc. Prof. Bozov has received important results for science and practice, original contributions have been made, which are visible in the international scientific space.

The abstract presented for the dissertation is written on 68 standard typewritten pages, contains 7 tables and 7 figures. The abstract accurately and accurately reflects the main scientific and applied scientific achievements of the dissertation.

CONCLUSION

The dissertation contains the necessary scientific, scientific-applied and applied results, which represent an original contribution to science and meet all the requirements of the Law for development of the academic staff in the Republic of Bulgaria. The presented materials and dissertation results fully comply with the specific requirements of the Faculty of

Biology, adopted in connection with the Regulations of the University of Plovdiv “Paisii Hilendarski ” for the application of the Law on Biological Sciences.

The dissertation shows that the dissertation Assoc. Prof. Dr. Petko Ivanov Bozov has in-depth theoretical knowledge and professional skills in the scientific specialty "Organic Chemistry" by demonstrating qualities and skills for conducting research with original and significant scientific contributions.

Due to the above, I confidently give my positive assessment and propose to award the scientific degree "Doctor of Science" to Petko Ivanov Bozov in the field of higher education: 4. Natural sciences, mathematics and informatics, professional field 4.2. Chemical sciences (Organic chemistry).

04/15/2021 Prepared the opinion: .....

Prof. D.Sc. Panteley Denev