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STATEMENT

by Assoc. Prof. Niko Benbassat, PhD
Associate Professor of "Pharmacognosy and Phytochemistry"
in a professional direction 7.3. Pharmacy
Department of Pharmacognosy and Pharmaceutical Chemistry,
Faculty of Pharmacy, Medical University-Plovdiv

Regarding: The readiness to defend a dissertation for the acquisition of the educational and science degree "Doctor" in the doctoral programme "Pharmaceutical Chemistry" Professional field 7.3 Pharmacy

Author: Velislava Dimitrova Todorova, MPharm, full-time PhD student at the Department of Pharmacognosy and Pharmaceutical Chemistry at the Faculty of Pharmacy at the Medical University-Plovdiv.

Title: Pharmacanalytical control of substances with adaptogenic properties from *Rhaponticum carthamoides* Willd.

Scientific supervisor: Assoc. Prof. Kalin Ivanov, PhD

1. Relevance of the topic

In recent years, there has been a growing interest in herbal products. Adaptogens such as *Rhaponticum carthamoides* (Leuzea), which normalise physiological processes and strengthen the body under stress, are the object of this thesis. These substances have the potential to enhance the quality of life, but their effects remain incompletely understood, necessitating further research.

Furthermore, to reliably assess their biological activity, it is essential to develop new, simpler, and more environmentally friendly methods for analyzing phytoecdysteroids in plant extracts. The relevance of this subject lies in the pressing need for innovative analytical approaches to monitor and evaluate the biological activity of these compounds. The findings will contribute to a deeper understanding of the mechanism of action and potential use in enhancing the quality of life of these substances.

2. Knowledge of the problem

The proof of the in-depth knowledge of the problem by the PhD student is provided in the literature review, which covers 49 pages. This dissertation highlights the evolution of the modern scientific field and explores the latest research trends. The literature review is organized into four subsections, providing a coherent summary of current research trends on adaptogens and

ecdysteroids, their biological activity, and therapeutic potential. This reflects a strong theoretical understanding and in-depth knowledge of the subject matter. The content of over 249 references was creatively evaluated in the formation of the literature review and in the description and interpretation of the results obtained.

3. Research methodology

The "Materials and Methods" section provides a detailed description of all the protocols used for the applied methods. The PhD student has used and mastered essential methods for pharmaceutical analysis, such as gas chromatography, high-performance thin-layer chromatography, and high-performance liquid chromatography with UV-Vis, PDA, and mass detectors. The application of these diverse techniques demonstrates that the PhD student has developed strong skills for independent research.

4. Characterisation and evaluation of the thesis and its contributions

The dissertation is 178 pages long and includes the following sections: Contents – 3 pages, Abbreviations – 2 pages, Introduction – 2 pages, Literature review – 49 pages, Aim and Objectives – 1 page, Materials and Methods – 16 pages, Results and Discussion – 58 pages, Conclusion – 2 pages, Conclusions – 1 page, Contributions – 1 page, List of publications related to the dissertation work – 2 pages, References – 38 pages. Data are presented in 24 tables and 39 figures. The cited references are 387, of which 170 are in the last 10 years and 114 in the last 5 years. Also included are up-to-date EMA and WADA websites. The contributions of scientific and theoretical significance are as follows:

The aim of the current thesis was to develop, optimise, and validate new analytical approaches for the control of substances with adaptogenic properties from *Rhaponticum carthamoides*, as well as to evaluate their potential biological activity. The set of seven objectives was scientifically based and implemented step by step. As a result, a quantitative analysis of the three ecdysteroids in the *Leuzea* extract was performed using various techniques. The developed methods are also suitable for the quantitative analysis of ecdysteroids in various plant extracts. Essential oil from the roots of the plant has also been isolated and characterised. Furthermore, the effects of *R. carthamoides* extract, 20-hydroxyecdysone, turkesterone, and ponasterone A on adipogenesis in an *in vitro* human adipocyte model and ageing processes in *C. elegans* were investigated. Extracts of *R. carthamoides* and 20-hydroxyecdysone were found to reduce adipogenesis and stimulate lipolysis, while turkesterone affected adipogenesis. In addition, the extract of *R. carthamoides* improved lipid metabolism in *C. elegans*, extended their lifespan, and delayed ageing. 20-Hydroxyecdysone improves the survival of *C. elegans* under oxidative stress and improves its resistance to heat stress.

5. Assessment of the publications and personal contributions of the PhD student

As part of the PhD defence procedure, the student has presented three publications with an impact factor, in which she is the lead researcher. Additionally, four participations in international scientific conferences are attached, where the most significant research findings were presented. She also serves as the lead researcher for one scientific project related to this dissertation.

I believe that the contributions of the dissertation largely reflect the work of the doctoral student, undoubtedly under the expert guidance of the scientific supervisor, Assoc. Prof. Kalin Ivanov, PhD.

6. Recommendations

In addition to acknowledging the scientific achievements of this dissertation, I would also like to offer a few recommendations:

1. References should be numbered.
2. The plant substances should be presented not only with their Latin names but also with their corresponding family.

7. Abstract

The abstract fully complies with the regulations of the Medical University - Plovdiv. This concise summary clearly reflects the results achieved. The abstract consists of 53 pages, accompanied by 11 tables and 19 figures. It provides a clear overview of the aim, objectives, results, discussion, conclusions, and contributions of the research.

CONCLUSION

The dissertation contains scientific, applied results, which represent an original contribution to science and comply with all the Law on the Development of Academic Staff in the Republic of Bulgaria (LDASRB), the Regulations for the Implementation of LDASRB, and the relevant Regulations of the MU- Plovdiv. The materials and results presented fully correspond to the specific requirements adopted in connection with the Regulations of the MU- Plovdiv, for the application of the LDASRB.

The dissertation shows that the PhD student Velislava Todorova possesses in-depth theoretical knowledge and professional skills in the scientific speciality of pharmaceutical chemistry, demonstrating qualities and skills for the independent conduct of scientific research.

Based on the above, I confidently give my positive assessment of the presented thesis, abstract, achieved results, and contributions. I confidently propose to the scientific jury to award the educational and scientific degree "Doctor" to Velislava Dimitrova Todorova in the doctoral programme in Pharmaceutical Chemistry.

07.01.2025

Plovdiv

Заличено на основание
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Prepared by /
/Assoc. Prof. Niko Benbassat, PhD/