

# OPINION

**From prof. D.Sc. Katya Naneva Velichkova, Trakia University – Stara Zagora**

of a dissertation for awarding the educational and scientific degree "**Doctor**"  
by: field of higher education 4. *Natural sciences, mathematics and informatics*  
professional direction 4.3. *Biological Sciences*  
doctoral program *Botany*

**Author:** Tsvetelina Georgieva Andonova

**Topic:** Phytochemical and biological studies on the invasive for the Bulgarian flora plant species *Ailanthus altissima* (Mill) Swingle and *Koelreuteria paniculata* Laxm.

**Scientific supervisors:** Prof. Dr Ivanka Zhecheva Dimitrova-Dulgerova PU „Paisii Hilendarski“ - Plovdiv

Assoc. Prof. Dr. Iliia Zhelev Slavov MU „prof. Dr Paraskev Stoyanov“ – Varna

## 1. General presentation of the procedure and the PhD student

By order No. PD-21-1788 of 08.11.2022 of the Rector of Plovdiv University „Paisii Hilendarski“ (PU) I have been appointed as a member of the scientific jury to ensure a procedure for the defense of a dissertation on a topic „Phytochemical and biological studies on the invasive for the Bulgarian flora plant species *Ailanthus altissima* (Mill) Swingle and *Koelreuteria paniculata* Laxm.“ for the acquisition of the educational and scientific degree "doctor" in the field of higher education 4. *Natural sciences, mathematics and informatics*, professional direction 4.3. *Biological Sciences*, doctoral program *Botany*. The author of the dissertation is Tsvetelina Georgieva Andonova - full-time doctoral student at the Department of "Botany and Biological Education" with a scientific supervisor Prof. Dr Ivanka Zhecheva Dimitrova-Dulgerova from PU „Paisii Hilendarski“ - Plovdiv and Assoc. Prof. Dr. Iliia Zhelev Slavov from MU „prof. Dr Paraskev Stoyanov“ – Varna.

The presented set of materials by Tsvetelina Georgieva Andonova on electronic media is in accordance with Art. 36 (1) of the Regulations for the Development of the Academic Staff of the PU and includes all the necessary documents, a request to the Rector of the PU to disclose the procedure for the defense of a dissertation work.

Doctoral student Tsvetelina Andonova was born on August 18, 1976. She completed her secondary education in 1994 at the "St. Patriarch Euthymius" - Plovdiv. She obtained her higher education in 2000 at the PU "Paisii Hilendarski" Plovdiv, as a master's degree in Biology. The work experience of the doctoral student is entirely related to her specialization in the field of biological sciences. She was a laboratory assistant for 5 years in the physico-chemical and microbiological laboratories of "Vinprom Peshtera" JSC - Plovdiv, as well as a biologist in departments of the Faculty of Biology at PU "Paisiy Hilendarski" - Plovdiv, the last of which is the department of "Botany and biological education". In this department that she is enrolled as a full-time doctoral student in the Botany doctoral program. Tsvetelina Andonova speaks German and English. She participated in two international scientific conferences.

## 2. Actuality of the topic

The topic of the dissertation is relevant, as the research concerning invasive species in Bulgaria is mainly ecologically oriented. The selected plant species *Ailanthus altissima* (Mill.) Swingle and *Koelreuteria paniculata* Laxm., which are widespread, but foreign to the territory of our country and to Europe, are examined for basic diagnostic microscopic signs and the chemical composition and biological activities of both species are analyzed. The set goal is clear and precisely formulated. The

tasks associated with the goal are well defined. The two selected species have valuable secondary metabolites and biologically active substances, but in Bulgaria there is a lack of research on the chemical composition and biological activity of the two species.

### 3. Knowing the problem

From the literature review, it can be seen that the doctoral student knows very well the issues and research related to the two studied species. The available scientific data on the phytochemical composition and biological activity of the two species have been very well tracked. 247 literary sources were used (1 in Cyrillic and 246 in Latin), which were skilfully analyzed and interpreted.

### 4. Research methodology

Modern methods applied in the field of botany, microbiology and genetics were used to conduct the experimental part of the dissertation work. The methods are selected according to the specifics of the planned tasks - chemical, physicochemical, spectrophotometric, chromatographic methods. Particularly impressive are the *in vitro* studies of biological studies of the extracts - antimicrobial, antitumor, antioxidant, DNA - protective potential. All data were processed using appropriate statistical methods.

### 5. Characterization and evaluation of the dissertation work and contributions

The dissertation has a volume of 148 pages and is structured according to generally accepted criteria and contains all the necessary sections - introduction, literature review, aim and objectives, materials and methods, results, discussion, conclusions, cited literary sources and appendices. The dissertation does not include a list of scientific publications related to the dissertation, as well as participation in scientific forums, but the same are presented in the abstract. The conducted research was carried out by applying internationally approved methods and standards, as a result of which adequate results were obtained and corresponding conclusions were formulated, which are 10 in number for one species *K. paniculata* and 10 conclusions for the other species - *A. altissima*. Based on everything presented in the dissertation, two groups of contributions are formulated: original scientific contributions and scientific-applied contributions.

The **original scientific contributions** are referred to:

- ✓ Basic diagnostic microscopic features of powdered plant substances from flowers, leaves and stem barks of *K. paniculata*, and flowers of *A. altissima* are indicated for the first time
- ✓ For the first time, the seasonal dynamics in the accumulation of total water-soluble polyphenols, tannins, flavonoids and phenolic acids in plant substances from *K. paniculata* and *A. altissima* were traced over a period of 3 years.
- ✓ For the first time, volatile components from aerial parts of *K. paniculata* were isolated by water distillation and identified by GC/MS analysis.
- ✓ For the first time, the phenolic profile (flavonoids and phenolic acids) of ethanolic extracts of dry substances (flower buds, flowers, leaves and stem barks) of *K. raniculata* was studied by HPLC analysis.
- ✓ Phytochemical composition and biological activities of ethanolic extracts of fresh plant substances of *K. paniculata* and *A. altissima* were studied for the first time.
- ✓ Phospholipid profile of fatty oils from *A. altissima* and *K. paniculata* seeds is reported for the first time
- ✓ DNA-protective potential of ethanolic extracts of flowers, leaves and stem barks of *K. paniculata* as well as flowers and leaves of *A. altissima* has been demonstrated for the first time.

The established three **scientific and applied contributions** related to the chemical composition and biologically active substances enable the inclusion of the extracts and oils of the two species *A. altissima* and *K. paniculata* in food, cosmetic and medicinal products.

## **6. Assessment of the PhD student's publications and personal contributions**

In connection with the defense of the dissertation, 2 scientific articles in English were presented in international refereed journals - Journal of Essential Oil-Bearing Plants (IF2020=1.541, Q3; SJR Q3 (2020): 0.36); Plants (IF2021 =4.658, Q1; SJR Q1 (2021): 0.77). The articles are in a collective, and in both the doctoral student is the first author, which proves the personal contribution to the obtained results. Tsvetelina Andonova reported the results of her dissertation development at two international scientific forums. The published data have attracted the attention of the international scientific community, as evidenced by the citation list of the candidate's works. These scientometric data fully cover and even exceed the legal requirements for the acquisition of the educational and scientific degree "Doctor".

## **7. Author's abstract**

The abstract includes a total of 32 pages, illustrated with 8 tables and 16 figures. The abstract adequately reflects the results and contributions of the dissertation work. All sections of the dissertation are presented correctly and fully summarize the research.

## **8. Recommendations for future use of dissertation contributions and results**

Bearing in mind the topicality of the issues of the dissertation work, I recommend the doctoral student to continue her research.

## **CONCLUSION**

The presented dissertation contains scientific and scientific-applied results, which represent an original contribution to science and meet the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for the Implementation of ZRASRB and the relevant Regulations of PU "Paisiy Hilendarski". The presented materials fully correspond to the specific requirements of the Faculty of Biology at the PU «P. Hilendarski», adopted in connection with the Regulations of the PU for the application of ZRASRB.

The dissertation work shows that Tsvetelina Georgieva Andonova possesses in-depth theoretical knowledge and practical skills in the scientific specialty "Botany", demonstrating qualities and skills for independent planning and conducting scientific research. This gives me grounds for a positive assessment of the conducted research and I propose to the honorable scientific jury to award the educational and scientific degree "Doctor" to Tsvetelina Georgieva Andonova in the field of higher education: 4. Natural sciences, mathematics and informatics, professional direction 4.3. Biological Sciences, Doctoral Program Botany.

14.11.2022

**Prepared the opinion:** .....

(prof. DSc Katya Velichkova)