Вх. № 1047/НО-05/ 15.11.2024 г.

STATEMENT

Assoc. Prof. Ivanka Bozhkova Semerdjieva, PhD

Associate Professor at the Institute of Biodiversity and Ecosystem Research at the Bulgarian Academy of Sciences, Regarding the Thesis for the Acquisition of PhD Academic Degree in the Field of Higher Education: 4. Natural sciences, mathematics and informatics; Professional

Direction: 4.3. Biological Sciences, Scientific specialty Botany (01.06.03);

Title of PhD thesis: "Hydroponic technologies as a means of protection and cultivation of medicinal and conservation significant plant species".

PhD Candidate: Boryanka Dimitrova Traykova

Scientific Supervisor: Prof. Marina Stanilova, PhD

Scientific Consultant: Assoc. Prof. Ina Aneva, PhD

By order of the Director of the Institute of Biodiversity and Ecosystem Research at the Bulgarian Academy of Science (BAS) No. 62/27.09.2024, I have been appointed as a member of the scientific committee for the procedure of the defense of the PhD thesis "Hydroponic technologies as a means of protection and cultivation of medicinal and conservation significant plant species" for the acquisition of PhD Academic Degree.

The PhD candidate Boryanka Dimitrova Traykova has submitted the complete set of documents (in both paper and electronic format), as indicated inChapter IV, Article 7 of the Regulations on the Conditions and Procedures for Acquisition of Academic Degrees and for the Occupation of Academic Positions at the Institute of Biodiversity and Ecosystem Research at BAS.

The dissertation examines the development of protocols for the propagation and growth acceleration of *Haberlea rhodopensis*, *Thymus longedentatus*, *Thymus pannonicus*, *Thymus zygioides*, *Vaccinium vitis-idaea*, *Echinacea purpurea*, *Salvia officinalis*, *Alkanna tinctoria*, *Lilium rhodopaeum*, and *Hippeastrum papilio* through the application by various hydroponic technologies. The target species are medicinal plants with conservation significance, characterized by difficulties in propagation (low germination rates and/or slow growth). On the one hand, solving the propagation problems of species that of potential interest to the pharmaceutical industry with limited resources, is a step toward developing technologies for

their cultivation. Furthermore, cultivating wild medicinal plants using environmentally friendly methods provides a way to preserve their populations and protect the environment. In this context, the results provided in the dissertation thesis are relevant and innovative because they correspond to the global and national strategies for protecting biodiversity and solving the issues associated with climate change.

The dissertation is structured correctly and follows the requiremens, citing 138 literary sources. The goal is clearly defined, and 6 tasks are defined for implementation. The literature review is well organized, with the doctoral student thoroughly reviewing previous research. The chapters "Materials and methods," "Results," and "Discussion" in the presented thesis have been replaced by 8 attached scientific publications, which do not contradict the Regulations on the terms and conditions for acquiring scientific degrees and holding academic positions at IBEI, BAS. The PhD student is the first or corresponding author in seven publications, demonstrating good preparation, creativity, and ability to interpret the results. Five of the presented scientific publications were published in international and national journals referenced and indexed in Web of Science or Scopus, with quartiles. The obtained results are of scientific and practical value, and they are well presented and illustrated in the articles. A significant scientific achievement by the PhD student is the successful cultivation, for the first time, of *H. rhodopensis*, *T. pannonicus*, *T. zygioides*, and the Balkan endemic *T.* longedentatus using hydroponic systems. Given the complicated and slow rooting of cuttings from the plants mentioned above (T. pannonicus, T. zygioides, and T. longedentatus) in a soil substrate, the results obtained for the rooting of cuttings of the species through the applied hydroponic systems are of practical importance. A significant scientific contribution was the development of adapted protocols for the cultivation and propagation of *H. rhodopensis*, *T.* longedentatus, T. pannonicus, T. zygioides, V. vitis-idaea, E. purpurea, S. officinalis, and A. tinctoria. The protocol for accelerated in vitro propagation of L. rhodopaeum and H. papilio has been refined by incorporating hydroponic cultivation of in vitro-derived bulbs to speed up their growth. This growing technology enhancement has significant practical value, as it reduces the time needed to introduce the species to in vitro culture, adapt the plants to greenhouse conditions, and cultivate them outdoors. Moreover, the refined protocol improves the rate of successfully acclimated plants. The results' significance and the research's relevance are evidenced by citations established from 2020 until 2024. The conclusions and contributions presented are a logical summary of the obtained results. The dissertation's contributions are clearly defined and confirm the relevance of the conducted study. The

abstract aligns fully with the content of the dissertation, thoroughly presenting the main results and contributions. Furthermore, presented abstract is excellently illustrated with tables, graphs, and figures.

The indicated significant results and their applied nature leave no doubt that PhD student Boryanka Traikova is a specialist in hydroponic technologies and applied botany. From the work presented, it is clear that she possesses deep theoretical knowledge and innovation. While developing the thesis, she mastered a complex set of methods, a prerequisite for her ability to perform independent scientific research with precision and thoroughness. An excellent assessment of her expert qualities is that she participated in 21 projects, including 3 international ones: national: FNI – 6, Ministry of Education and Culture - 3, other ministries – 3, under contracts – 3, and budgetary –3.

CONCLUSION

Boryanka Traykova's PhD thesis contain scientific and scientific-applied results, which are an original contribution to science and practice. The PhD student demonstrate excellent theoretical and professional training. The dissertation fully meet all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (SRASR), as well as the Regulations on the terms and conditions for acquiring scientific degrees and occupying academic positions at IBEI-BAS. **Based on what has been stated so far, I give my POSITIVE assessment and propose to the respected scientific committee to award a PhD degree to Boryanka Dimitrova Traikova, in the field of higher education 4. Natural sciences, mathematics and informatics, Professional direction 4.3 Biological sciences, scientific specialty Botany (01.06.03).**

Sofia

The Statement of opinion was prepared by:

15 November 2024

/Assoc. Prof. Ivanka Semerdjieva PhD/