

SCIENTIFIC OPINION

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Regarding a PhD dissertation for awarding the educational and scientific degree "Doctor" (PhD) in Higher Education Area: 6. Agricultural Sciences and Veterinary Medicine, Professional Field: 6.5. Forestry, Scientific Specialty: Forest Melioration, Forest Protection, and Special Forest Uses

Author of the Dissertation: Veselin Georgiev Ivanov

Dissertation Title: Health status of tree vegetation in field protection forest belts in Northeastern Bulgaria, and measures for improvement

Member of the Scientific Jury: Assoc. Prof. Nikolay Georgiev Zafirov, PhD

1. Brief Presentation of the PhD Candidate

The PhD candidate Veselin Georgiev Ivanov graduated from the University of Forestry – Sofia, acquiring a Master's degree in Forestry in 2013, with a specialization in "Forest Exploitation and Forest Economics". His professional career is closely linked to the forestry sector. Over the years, he has held positions such as "Forestry District Manager" at the Territorial Unit "DLS Balchik" and "Forester" at the Territorial Unit "DGS Dobrich", which has enabled him to gain valuable practical experience in the field of forestry and the protection of forest ecosystems. Since July 1, 2024, he has been working as an "Assistant Professor" at the Forest Research Institute of the Bulgarian Academy of Sciences (BAS).

By Order No. RD 15-530 dated December 16, 2022, issued by the Director of the Forest Research Institute at BAS, the candidate was enrolled in a part-time PhD program in Professional Field 6.5. Forestry, Scientific Specialty "Forest Melioration, Forest Protection, and Special Forest Uses". The PhD student was deregistered with the right to defense by Order No. RD 15-243 dated May 13, 2026. The presented dissertation is titled "Health Status of Woody Vegetation in Shelterbelts in Northeast Bulgaria and Measures for Improvement", under the scientific supervision of Corr. Memb. DSc Georgi Tsvetkov Georgiev.

2. General Characteristics of the Dissertation – Volume and Structure

The dissertation presented for review is 147 pages in volume and is formatted in accordance with the current requirements. It possesses a traditional structure for the scientific field and includes: an introduction, aim and objectives, literature review, materials and methods, results and discussion, conclusions, recommendations, contributions, a list of used literature, and a list of used abbreviations. The main body of the dissertation (from the introduction to the contributions) spans 131 pages of computer text. The structural ratio between the individual chapters is balanced, with the largest portion (just over 58% of the volume of the main body) dedicated to the chapter containing the results and their interpretation.

The illustrative material contains 80 figures (diagrams, graphs, maps, and original photos of the sites, damage to woody species, pathogens, and pests). It is appropriately distributed, being concentrated mainly in Chapters 3 "Materials and Methods" (which also presents a description of the study area) and 4 "Results and Discussion". The dissertation also includes 23 tables, which summarize larger volumes of data.

The bibliographic reference includes a total of 142 literature sources. Of these, 51 are in Cyrillic and 91 in Latin, which demonstrates a high proportion of foreign language literature. There are no separate appendices to the dissertation, as all factual material has been integrated into the main text.

3. Relevance of the Problem

The topic of the dissertation, "Health status of tree vegetation in field protection forest belts in Northeastern Bulgaria, and measures for improvement", is highly relevant and addresses one of the most critical issues in contemporary Bulgarian forestry. The shelterbelts in Southern

Dobrudzha are of strategic importance for the country, protecting the most fertile agricultural lands from wind erosion, regulating the microclimate, and conserving soil moisture. In recent decades, however, processes of widespread dieback and degradation have been observed in these artificial ecosystems. This renders the study of their health status a scientifically significant task.

The relevance of the work is further enhanced by the fact that the PhD candidate does not merely document the deteriorated condition of the shelterbelts, but delves deeply into the biotic factors driving it. The integrated approach, combining phytopathological, entomological, and silvicultural methods, enables the identification of specific causal agents of the dieback affecting the main woody species (genera *Fraxinus*, *Quercus*, *Acer*, *Ulmus*, and *Tilia*).

From a practical perspective, the dissertation is also exceptionally relevant, as it proposes scientifically grounded measures for the improvement and reconstruction of shelterbelts, as well as a mobile GIS application for field data collection. This work provides forestry practice with digital tools for monitoring, forecasting, and planning protective measures within the forest plantations of Dobrudzha.

4. Literature Awareness

The literature review is organized into Chapter 2 of the dissertation and covers 23 pages, which represents a balanced volume for a theoretical introduction to the topic. The text demonstrates a very good background and capability of the PhD candidate to analyze and synthesize large amounts of scientific information.

The sequential approach of the narrative stands out within the structure of the review. At the beginning (subsection 2.1), the candidate convincingly justifies the economic and ecological necessity for the establishment of shelterbelts. A major merit of the review is the detailed analysis of global experience in this field (subsection 2.2). The PhD candidate examines the construction and management of large-scale shelterbelt systems abroad, covering countries with long-standing traditions in steppe forestry such as Russia, the USA, Canada, China, and neighboring Romania.

In subsection 2.3, the candidate historically traces the establishment and development of shelterbelts in Bulgaria, focusing on the specific characteristics of the Dobrudzha region. Rather than merely listing events chronologically, the author reviews the practices and factors that have led to the current state of the plantations.

The high level of literature awareness of the candidate is supported by the quantitative and qualitative parameters of the bibliographic reference. The large share of foreign literature (nearly 64%) is impressive, providing undeniable evidence that the PhD candidate is well-acquainted with the current state of the examined problem on an international scale and is familiar with the latest trends in forest protection. Citations in the text are presented correctly, in compliance with academic standards.

The conducted review serves as a solid theoretical foundation for the transition to the subsequent stages of the dissertation. It enables the author to identify existing gaps in scientific knowledge and to motivate the necessity for achieving the aim and research objectives of the present study.

5. Aim, Objectives, and Research Methods

The aim formulated in the dissertation is large-scale, clearly defined, and fully corresponds to the title of the work. It is directed toward conducting an integrated assessment of the health status of woody species used for afforestation in shelterbelts, determining the main factors responsible for the deterioration of their condition, and developing measures for their improvement. To achieve this aim, the PhD candidate has set six precisely structured research objectives that cover the entire spectrum of the problem—from the initial field inventory and clarification of biotic complexes to the final planning of measures for shelterbelt improvement and the selection of species for their reconstruction.

The methodology applied for the execution of these objectives (organized in Chapter 3)

combines established approaches, an interdisciplinary character, and a modern technological level. The study area is described with precision, providing a detailed physical-geographical characterization of Dobrudzha (Northeast Bulgaria). The chosen research approach successfully unites classical methods for assessing the health status of woody species with highly specialized entomological and phytopathological investigations, including the identification of collected biological material using established international identification keys in the laboratories of the Forest Research Institute at BAS.

A particular merit of the methodological section is the implementation of modern digital technologies. The field data collection on defoliation (assessed according to the international methodology of ICP Forests on a 5-point scale) has been modernized through a specially created integrated platform based on ArcGIS Online and the Field Maps mobile application, allowing for offline field records. This approach is combined with remote sensing methods for assessment in the area of the Territorial Unit "DLS Balchik" using high-resolution multispectral satellite imagery from the Planet system (PlanetScope/SkySat) to calculate the Normalized Difference Vegetation Index (NDVI).

The proposal and field testing of a new methodology for the integrated assessment of shelterbelts should be highlighted as an important methodological contribution. The candidate's methodological preparation in planning the biological control experiment against the gypsy moth under atypical forest conditions also deserves special attention, accompanied by laboratory and microscopic analysis of its effectiveness. The mathematical processing and statistical reliability of the entire factual material are guaranteed through the use of specialized software packages, namely Statistica and Microsoft Excel, which renders the conclusions fully representative.

6. Significance of the Obtained Results, Interpretations, Visual Presentation, and Conclusions

The primary scientific and practical weight of the dissertation is concentrated in Chapter 4 "Results and Discussion", which occupies an impressive volume of 77 pages. The significance of the obtained results is exceptionally high, as they represent the first targeted and in-depth studies on the health status of woody species within the shelterbelt system in Southern Dobrudzha in 40 years. The importance of the investigation is highlighted by its scale – it covers the territory of the State Forestry Enterprise Units "DLS Balchik", "DGS Dobrich", "DGS General Toshevo", where as much as 72% (7,668.2 ha) of all shelterbelts in Bulgaria are concentrated.

Regarding data interpretation, the PhD candidate demonstrates a highly analytical approach. The study is built upon a solid methodological foundation and a representative sample of 190 shelterbelts. The candidate successfully interprets the complex processes of degradation, outlining a sharp decline in the health status of the shelterbelts during the 2023–2025 period. The author does not merely document the alarming dieback trend, but conducts an analysis of its underlying causes. A clear link is traced between the aging of the plantations (the majority of which are over 70 years old) and abiotic stress – namely the lack of winter moisture accumulation during the study period, combined with prolonged droughts and heatwaves. The PhD candidate examines this weakening in combination with the widespread infestation of insect pests and pathogens.

The detailed phytopathological and entomological analysis of specific woody genera is impressive. The author documents the total mortality of elm due to Dutch elm disease (*Ophiostoma ulmi*), and of Sycamore maple, Norway maple, and field maple due to *Cryptostroma corticale*, accompanied by the first detection of *Stegonsporium pyriforme* and *Massaria macra* in Bulgaria. The aggressive development of pathogens from the genus *Biscogniauxia* on the investigated oak and linden species is also reported. The PhD candidate analyzes the damage caused by *B. mediterranea*, under which the proportion of dying northern red oaks increased from 50.8% to 90.8% over three years, with severe impacts on pedunculate oak and Hungarian oak as well. He also documents a severe deterioration in the condition of

silver linden caused by *B. cinereolilacina* over these years.

Among species of the genus *Fraxinus*, the dieback is linked to the activity of xylophagous insects and five species of singing cicadas, whose high density also threatens coppice regeneration. Comparative analysis shows that Turkey oak and honey locust exhibit the best health status within the shelterbelts, although their degradation processes also intensified over the three-year period. A significant contribution to forest entomology is the faunistic study, which discovered 12 species and subspecies of xylophagous insects from 4 families (dominated by representatives of the family Buprestidae on oaks), as well as the identification and differentiation of 10 species of dendrophilous insects (saproxylic, mycophagous, and predatory species).

In the conclusions, the PhD candidate conducts a valuable critical analysis of the historical mistakes made during the establishment and management of shelterbelts in the region. It is argumentatively proven that black locust is unsuitable as a main woody species due to its low height, short lifespan, and excessive number of coppice rotations. On the other hand, the author criticizes the harvesting of honey locust after the age of 50, demonstrating that the species maintains excellent health and shows no signs of decay even at 60–70 years of age.

The candidate successfully applies GIS technologies and data from the PlanetScope/SkySat satellite system to assess the protective capacity of the shelterbelts. The use of the Normalized Difference Vegetation Index (NDVI) allows for the precise differentiation of the risk of condition deterioration and mortality among ash species, Turkey oak, and honey locust within the shelterbelts.

The visual presentation of the dissertation is of a high standard. The significant number of figures and tables facilitates the comprehension of complex scientific information and demonstrates the precision of the conducted field and laboratory investigations.

The conclusions formulated at the end of the work correspond to the set research objectives. They are shaped concretely and clearly, reflecting the objective results of the performed study on the health status of woody species in the shelterbelts.

7. Contributions of the Dissertation

The contributions formulated at the end of the dissertation are correctly derived and represent a direct result of the candidate's research activity. They possess both scientific and practical value and can be divided into two main groups:

A. Scientific contributions (of a fundamental nature):

Pioneering phytopathological and faunistic records: For the first time in Bulgaria and Europe, the presence of the fungal pathogen *Biscogniauxia mediterranea* has been reported on northern red oak (*Quercus rubra*). For the first time on the Balkan Peninsula and in Southeastern Europe, the predatory fly *Pogonosoma minus* has been established. The find of the oak weevil *Gasterocercus depressirostris depressirostris* represents the first written record of the presence of this species in the entomofauna of Bulgaria.

New trophic associations to science and the country: Three new trophic associations to science have been established between xylophagous insects of the genus *Agrilus* and woody species (*Juglans regia*, *Quercus rubra*, *Quercus cerris*). A trophic relationship between the predatory fly *Pogonosoma minus* and the weevil *G. depressirostris*, previously unknown to science, has also been registered. Additionally, 16 trophic connections new to Bulgaria have been discovered for xylophagous insects of the order Coleoptera on oak and linden species.

First phytopathological records for the country: For the first time in Bulgaria, the important fungal pathogens *Stegonsporium pyriforme* and *Massaria macra* have been established on Norway maple and field maple.

B. Scientific-applied and applied contributions:

Innovative biological control: For the first time in Bulgaria, biological control against the gypsy moth (*Lymantria dispar*) has been applied under the atypical forest conditions of the shelterbelts in Dobrudzha through the dissemination of the entomopathogenic fungus

Entomophaga maimaiga.

Digitalization and GIS technologies in practice: An original mobile application has been developed and tested on the ArcGIS Field Maps platform, featuring 31 specific evaluation fields. This application enables the rapid collection of field forest-protection information without a direct internet connection.

Methodological contributions to forest fund management: An original methodology for the integrated assessment of shelterbelts based on structural, functional, and health indicators has been developed. It has been validated across a large number of sites in the country, rendering it applicable for planning and decision-making in degrading shelterbelt systems both in Bulgaria and abroad.

All the presented contributions carry scientific value in the respective field and prove that the dissertation is a complete, high-level piece of scientific research.

8. Critical Remarks and Questions

The presented dissertation has been developed at a high scientific and applied level, involving a vast volume of field and experimental work. Nevertheless, a detailed reading reveals some technical and editorial omissions:

1. A technical error was made during the final formatting of the text, whereby the heading of Chapter 2 "Literature Review" was omitted from the table of contents, although its subsections are included. Furthermore, Chapter 8 "Publications on the Topic of the Dissertation" is also missing from the table of contents, despite being physically present at the end of the material.
2. On page 41, where the individual criteria for the integrated assessment of shelterbelts are described in detail, the textual presentation of "Indicator 4" is missing. Since it is evident from the preceding Table 4 and subsequent explanations that there are five indicators in total, this omission is of a purely technical nature; however, it disrupts the consistency of the narrative in the methodological section.
3. In certain parts of the text, isolated stylistic and punctuation inaccuracies, as well as typographical errors, can be encountered (for instance, in conclusion 5.9, the Bulgarian word for "shelterbelts" is misspelled as "полезашните" instead of "полезашитните"), which, however, do not alter the scientific meaning of the presented material.

The remarks made do not diminish the value of the dissertation but aim to assist the candidate in the future publication of the results in scientific journals.

At the present stage, I have no pre-formulated questions for the candidate. Any questions that may arise during the discussion will be asked directly during the public defense of the dissertation.

9. Assessment of the Quality of Scientific Publications

The results of the dissertation by PhD candidate Veselin Georgiev Ivanov have received wide popularization. Three scientific publications have been printed on the research topic, reflecting the main contributions of the dissertation. The quantitative and qualitative indicators of the publications satisfy the minimum national requirements for acquiring the educational and scientific degree "Doctor" (PhD).

A review of the presented works shows the following distribution:

International publication in a refereed journal with an impact factor: Publication 8.1 in the prestigious scientific journal *Biodiversity Data Journal* (with an impact factor of 1.100) serves as a testament to the international value of the study. It is dedicated to the discovery of the xylophagous pest *Gasterocercus depressirostris depressirostris* on Turkey oak in Bulgaria, as well as the first record of its predatory fly, *Pogonosoma minus*, on the Balkan Peninsula. The fact that the article was accepted into this international publication confirms the high precision of

the candidate's entomological research.

Publication in a national scientific journal: Publication 8.2, printed in the journal Forest Science (Nauka za gorata – a publication of the Forest Research Institute at BAS), is entirely the independent work of the PhD candidate. It examines in detail the bio-ecological features and harmfulness of the singing cicada *Pagiphora annulata* in the young shelterbelts of Southern Dobrudzha. The work contains valuable data regarding the damages and oviposition habits of the insect pest.

Publication in scientific conference proceedings: Publication 8.3 was printed in the proceedings of the 34th International Scientific Conference "Management and Quality, Ecology and Management of Forest Resources". In it, the PhD candidate (as the first author) presents the results from monitoring the health status of woody species from the genus *Fraxinus* in the shelterbelts of Southern Dobrudzha.

In two out of the three presented works, the PhD candidate is the first author, which proves his leading role in planning the experiments, collecting the field material, and analyzing the scientific results. There is no evidence of plagiarism in the presented works. It can be concluded that the publications popularize the valuable scientific and applied achievements of the dissertation before both the Bulgarian and international academic communities.

10. Personal Contribution of the PhD Candidate

The analysis of the dissertation and the scientific publications provides grounds to conclude that the obtained results and the formulated contributions are, to a decisive extent, the work of the PhD candidate Veselin Georgiev Ivanov, achieved under the methodical mentorship of his scientific supervisor.

The work reflects a vast volume of field work on assessing the condition of the shelterbelts in Southern Dobrudzha, which was carried out personally by the candidate. He played the primary role in collecting the factual material, developing and testing the mobile GIS application for data digitalization, as well as in their subsequent statistical processing. The dissertation possesses a clear and individual scientific style, has been developed independently, and shows no evidence of plagiarism.

CONCLUSION

Based on the various research methods learned and applied by the PhD candidate, the correctly derived experiments, and the generalizations and conclusions made, I consider that the presented dissertation meets the requirements of the Act on Development of the Academic Staff in the Republic of Bulgaria (ZRASRB) and the Regulations on the Terms and Procedures for Acquiring Scientific Degrees and Occupying Academic Positions at the Bulgarian Academy of Sciences (BAS). This provides me with the grounds to evaluate it **POSITIVELY**.

I propose to the esteemed Scientific Jury to vote positively and to award Veselin Georgiev Ivanov the educational and scientific degree "Doctor" (PhD) in the Higher Education Area 6. Agricultural Sciences and Veterinary Medicine, Professional Field 6.5. Forestry, Scientific Specialty "Forest Melioration, Forest Protection, and Special Forest Uses".

DATE: 13.07.2026

PREPARED BY:

(Assoc. Prof. Nikolay Zafirov, PhD)