

REVIEW

on a dissertation for acquiring the degree Doctor of Philosophy (Ph.D.) in field of higher education 6. Agricultural sciences and veterinary medicine, professional direction 6.5. Forestry, scientific specialty „Forest Melioration, Forest Protection and Special Forest Uses“

Author of the thesis: eng. Veselin Georgiev Ivanov

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

Author of the review: Professor Danail Doychev, Ph.D. – University of Forestry, Sofia

1. Brief presentation of the Ph.D. student

Veselin Ivanov was born in 1987. His higher education includes the educational and qualification degrees "Bachelor" (in 2011) and Master of Engineering in "Forestry" (2013) at the University of Forestry, Sofia.

His professional career in the field of forestry began at the State Forestry Service "Dobrich" in 2013 as a forester, and from 2016 he continued at the State Forestry Service "Balchik", where he held the position of section head until 2024. Subsequently, and to this day, he is an assistant at the Institute of Forestry (IF) - BAS (Sofia), engaged in field and laboratory research in the field of forest protection.

At the end of 2022, he was enrolled as a part-time PhD student at the IF with the topic of his dissertation work " Health status of tree vegetation in field protection forest belts in Northeastern Bulgaria, and measures for improvement ", and in May 2026 he was dismissed with the right of defense.

2. General characteristics of the PhD thesis – volume and structure

The dissertation has a total volume of 147 pages, and without the literature review – 134 pages. It contains an introduction, four separate chapters (1. Aim and objectives; 2. Literature review; 3. Material and methods; 4. Results and discussion), "Conclusions", "Recommendations", "Contributions" and "References". The largest part in terms of volume is taken up by chapter 4. Results and discussion (78 pages). The main text of the dissertation contains a total of 23 tables and 80 figures, presenting schemes, graphs, photographs and parts of maps. A list of abbreviations used has been added at the end, but its place should be at the beginning of the work. The

dissertation has been submitted in paper form, as well as on a digital medium, in PDF format.

3. Relevance of the researched problem

Field protection forest belts (FPFB) are linear forestry facilities, the main purpose of which is to create conditions for the formation of a specific microclimate in areas occupied by agricultural crops in steppe and forest-steppe regions. Through them, it is possible to reduce the wind speed, and thus - to reduce the energy and heat exchange of the agricultural territory located between the belts. In Bulgaria, their creation and use began nearly a century ago, with this process significantly intensifying in the 1950s. Currently, forest protection belts in our country are experiencing strongly pronounced drying processes, as a result of various factors, mainly drought and the development of phytopathogens. The topic of this dissertation is particularly relevant, given the important environmental protection functions of these belts, the ongoing phytosanitary problems in them, as well as the lack of more modern and in-depth studies in this area.

4. Awareness of the literature

The list of used literature is 12 pages long and contains a total of 142 titles, of which 51 are in Cyrillic and 91 in Latin. The need for these belts, the peculiarities of their structure, construction and tree species composition are presented in detail. Details of their creation and use abroad are presented, with particular attention paid to the former USSR and Russia of the 19th century. However, the most space is devoted to the review of the history and development of the field protection forest belts in Bulgaria, with an in-depth presentation of the methods used for their creation and management, as well as the observed insect pests, pathogens and the impact of abiotic factors on their health.

5. Purpose, objectives and research methods

The purpose of the work is well formulated with clearly presented specific tasks. A detailed characterization of the main physical and geographical features of the study area, which covers the territory of one State Hunting Area (Balchik) and two State Forestry Services (General Toshevo and Dobrich), has been made. The field protection forest belts there occupy over one fifth of their total forest area. As many as 190 experimental areas have been set up in these belts, proportionally covering the main tree species used there. When monitoring these sites, basic silvicultural and tax indicators, structural and functional characteristics, management, and assessments of defoliation of

the tree stand have been taken into account. An integrated platform including a GIS application, as well as a mobile one, has been used to assess the health status.

A new methodological approach has been successfully implemented, including an integrated assessment of the state of the FPFB, in which various indicators of the structure and phytosanitary indicators of the belts have been used.

For the isolation of insect pests and fungal phytopathogens, numerous plant samples were collected and processed. Insects at different stages of their development were photographed, as well as their damage. Mycelial cultures were also isolated in a laboratory environment.

Multispectral satellite images with high resolution and subsequent field verification of the data were also used to assess the health status of the belts.

Additionally, the technological processes during the reconstruction and cultivation of the newly created field protection belts were analyzed.

Biological control was carried out against one of the most significant insect pests in this part of Bulgaria - the gipsy moth (*Lymantria dispar*), using the entomopathogenic fungus *Entomophaga maimaiga*.

A statistical analysis of the obtained data was also performed.

6. Significance of the obtained results, interpretations, visualization and conclusions

The assessments of the health of the tree stand at the work sites cover over two-thirds of the area of the field protection forest belts in the country in general. The dynamics of deterioration of their condition over a period of 7-8 years have been established. The tree species with the most pronounced drying have been identified - for 2022, these were *Fraxinus excelsior*, *F. americana* and *F. angustifolia*. For the period 2023-2025, a steady trend of deterioration of the condition is observed in all species, with the most severely affected being the *Ulmus minor*, *Fraxinus angustifolia*, *Juglans regia* and *Quercus rubra*. The data from this study provide an opportunity for the correct selection of tree species during management, reconstructions and creation of new belts, according to the specific conditions.

Insect pests and fungal pathogens of individual tree species have been studied in detail - mainly for ash, oak and sycamore. Of value for forest protection practice in our country are the data on damage by cicadas on representatives of the genus *Fraxinus*, damage by *Gasterocercus depressirostris* and the jewel beetles of the genera *Agrilus* and *Chrysobothris* on oaks, as well as the identified pathogens such as *Biscogniauxia mediterranea* on *Quercus rubra*, *Cryptostroma*

corticale on the genus *Acer*, *Biscogniauxia cinereolilacina* on the silver-leaved lime.

There are also new faunistic data related to the identified insect pests and their entomophages.

The role of the entomopathogenic *Entomophaga maimaiga* in suppressing the population size of the fungus has been proven, not only in typical forest plantations, but also in shelterbelts.

The potential for using remote methods for surveying and assessing the phytosanitary condition has also been shown, while distinguishing the leading influence of individual factors (e.g. insect pests) in different tree species (field ash, *Quercus cerris* and *Gleditsia triacanthos*) has been analyzed.

Problems and mistakes made in the management of shelterbelts in our country have been analyzed. These results are clearly reflected in the formulated conclusions and specific recommendations for the management and monitoring of the condition of these facilities.

The exhibition is very well illustrated with graphs, tables, and author's photographs.

7. Contributions of the dissertation

The contributions made by the doctoral student can be grouped as scientific and applied science, as follows:

Scientific contributions:

1. The main biotic factors responsible for the deterioration of the health status and drying of the main tree species in the field protection forest belts in Southern Dobrudzha have been identified: the fungal pathogens *Ophiostoma ulmi* on *Ulmus minor*; *Cryptostroma corticale*, *Stegonsporium pyriforme* and *Massaria macra* on the genus *Acer*; *Biscogniauxia mediterranea* on the genus *Quercus*; *Biscogniauxia cinereolilacina* on *Tilia tomentosa*; singing cicadas (Hemiptera, Cicadidae) on *Fraxinus* spp., etc.
2. For the first time in our country, the following phytopathogenic fungi with their respective hosts have been identified: *Biscogniauxia mediterranea* - *Quercus rubra* (the report is also new for Europe); *Stegonsporium pyriforme* and *Massaria macra* - on *Acer platanoides* and *A. campestre*.
3. Three new for science nutritional relationships between xylophagous insects and tree species were established: *Agrilus graminis* - *Juglans regia*, *A. hastulifer* - *Quercus rubra* and *A. litura* - *Quercus cerris*.

4. Sixteen new trophic associations between xylophagous insects and tree species were registered in Bulgaria: *Gasterocercus depressirostris* – *Quercus cerris*; *Chrysobothris affinis* – *Quercus cerris* and *Q. rubra*; *Agrilus graminis* – *Quercus cerris* and *Q. rubra*; *Agrilus hastulifer* – *Quercus cerris*; *Agrilus laticornis* – *Quercus cerris*; *Melasis buprestoides* – *Tilia cordata*; *Lichenophanes varius* – *Tilia tomentosa*; *Plagionotus detritus* – *Quercus cerris*; *Xylotrechus antilope* – *Quercus cerris*; *Exocentrus adpersus* – *Quercus cerris*, *Q. petraea*, *Q. robur* and *Q. rubra*; *Mesosa nebulosa* – *Quercus rubra*.
5. The discovery of *Gasterocercus depressirostris* is the first written record of the occurrence of the species in Bulgaria.
6. From the larval stages of *Gasterocercus depressirostris*, a new species for the asilid fauna of Bulgaria was isolated for the first time – *Pogonosoma minus* (Diptera, Asilidae), which is also a new species for the Balkan Peninsula and Southeastern Europe. The trophic relationship between the predatory fly and the beetle is unknown to science so far.

Scientific and applied contributions:

1. For the first time in Bulgaria, a successful biological control of the gipsy moth was carried out in field protection forest belts of *Quercus cerris* by the introducing of *Entomophaga maimaiga*.
2. A mobile application for collecting data from field surveys and assessing the health status of trees was developed and tested, based on ArcGIS Field Maps from ESRI, suitable for Android and iOS.
3. An original methodology for an integrated assessment of the condition of field protection forest belts was developed and implemented, including the structural and functional characteristics of the stands and the health status of the tree species, which can be applied in other regions and countries when making decisions for the management of degrading field shelterbelts and planning the necessary silvicultural activities.

8. Critical notes and recommendations

The remarks I can make about the work are entirely of a technical nature, for example, the table of contents (p. 2) omits the mention of the literature review.

9. Assessment of the quality of scientific publications

Three scientific publications by the doctoral student directly related to the topic of the dissertation are presented as follows:

- Ivanov V., Kechev M., Georgieva M., Belilov S., Mirchev P., Hubenov Z., Georgieva L., Georgiev G. 2025. *Gasterocercus depressirostris depressirostris* (Fabricius) (Coleoptera, Curculionidae) – a new xylophagous pest of *Quercus cerris* L., and a new robber fly (Diptera, Asilidae) predator on it in Bulgaria. Biodiversity Data Journal, 13, e167767. doi: 10.3897/BDJ.13.e167767. (IF: 1.100).
- Ivanov V. 2025. Bioecological characteristics and harmfulness of *Pagiphora annulata* (Hemiptera: Cicadidae) in young field protective forest belts in Southern Dobrudzha, Northeastern Bulgaria. Nauka za gorata, 60 (2): 39-47.
- Ivanov V., Georgiev G., Georgieva M., Dodev Y., Belilov S., Kechev M., Mirchev P., Madzhov S., Georgieva L., Petrova D. 2025. Health status of tree species of the genus *Fraxinus* in the field protective forest belts in Southern Dobrudzha. 34 International scientific conference "Management and quality" - Ecology and management of forest ecosystems, June 5, 2025, Sofia, Avangard Prima, 56-61. ISBN:2603-4409.

The publications are in two scientific journals and in a proceeding from an international scientific conference. One of the publications is independent, and the other two are co-authored, with V. Ivanov as the lead author.

The presented articles contain data reflecting some of the faunistic contributions of the doctoral student; research on the role of the cicada *Pagiphora annulata* as a pest of ash trees; summarized results of field studies on the condition of the most widely used tree species in the field shelterbelts.

This fulfills the scientometric requirements of the ZRASRB and the Regulations on the conditions and procedure for acquiring scientific degrees and for holding academic positions at the Bulgarian Academy of Sciences in relation to the required publications by the doctoral student.

10. Personal contribution of the doctoral candidate

The personal participation of the doctoral student in the field research, in analyzing the results, and in shaping the dissertation is indisputable to me and is confirmed by his leading authorship in the presented publications.

CONCLUSION:

Based on the various research methods mastered and applied by the doctoral student, the processing of the results, the summaries and conclusions made, I believe that the presented dissertation meets the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADABRB) and the Regulations on the Terms and Procedures for Acquiring Scientific Degrees and Holding Academic Positions at the Bulgarian Academy of Sciences, which gives me reason to evaluate it POSITIVELY.

I propose to the esteemed Scientific Jury to vote positively and award eng. Veselin Georgiev Ivanov the educational and scientific degree "Doctor" in the field of higher education "6. Agricultural Sciences and Veterinary Medicine", professional direction "6.5. Forestry" and scientific specialty "Forest Reclamation, Forest Protection and Special Uses in Forests".

Date: 04.07.2026 г.

Author of the review:

/Professor Danail Doychev, Ph.D./