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## OPINION

on a dissertation for obtaining the educational and scientific degree "Doctor" in the field of higher education 6. Agricultural sciences and veterinary medicine, professional field 6.5. Forestry, scientific specialty "Forest plantations, selection and seed production"

Author of the dissertation: **NIKOLAI YANCHEV STOYANOV**

Topic of the dissertation: **DISTRIBUTION, VARIABILITY AND HEALTH CONDITION OF SPECIES FROM R. ULMUS SP. IN NORTHERN BULGARIA**

Member of the scientific jury: **Assoc. Prof. Dr. Svetla Bratanova-Doncheva**

This review was prepared pursuant to Order №RD-15-298 / 14.04.2021 of the Director of IG-BAS, for the appointment of a Scientific Jury in connection with the procedure for obtaining the educational and scientific degree "Doctor"

### 1. Brief biographical data

**NIKOLAI YANCHEV STOYANOV** is graduated from University of Forestry -Sofia in 1997, as a Forestry Engineer and acquired a Master's degree. In 2008 he graduated from the University of Agronomy in Plovdiv, as an agronomist in Plant Protection and obtained a Master's degree.

Over the years he has been engaged in various activities, successively working at UF – Research Sector (1997-1999), chief expert at the Forest Seed Control Station in Sofia (1999-2008), director of the Forest Protection Station in Sofia (2017- 2019) and manager of a private company specializing in forestry services (2008-2017 and from 2019 - until today). In 2019 with Order №RD15-181 / 19.03.2019. is enrolled as a doctoral student in independent training in the field of higher education 6. Agricultural sciences and veterinary medicine, professional field 6.5. Forestry, scientific specialty "Forest plantations, selection and seed production. The doctoral student has completed additional courses for general training in the scientific field related to the topic of the dissertation in "Corel Draw and Photoshop" (2000), "English" (2000), "Statistical Data Analysis" (2000), "Monetary valuations of forests and lands" (2021) The estimate for the preparation of Nikolay Stoyanov on the credit system of the Central Office at BAS in the implementation of the individual work plan within the educational and scientific program is 462 points. (with a mandatory minimum of 250 points).

### 2. General characteristics of the dissertation - volume and structure.

The dissertation on the topic "***DISTRIBUTION, VARIABILITY AND HEALTH CONDITION OF SPECIES BY R. ULMUS SP. IN NORTHERN BULGARIA***" of Nikolay Stoyanov is structured according to the requirements of the Law for development of the academic staff in the Republic of Bulgaria and the Regulations and its application, as well as according to the required scientometric indicators for obtaining a scientific degree at the Forest Research Institute - BAS.

The dissertation contains 121 pages and has standard content - introduction, literature review, main aim, purposes and tasks, research sites and methods, results and analysis, conclusions and recommendations.

In the chapter **Results and discussion** the material is presented in sections - Distribution of the representatives of the genus *Ulmus*; Study of the variability of the representatives of the genus *Ulmus*; Assessment of the health condition of the stands in the permanent sample areas; Preservation of the genetic resources of the genus *Ulmus* by the *In situ* and *Ex situ* methods. Presented are also- references for contributions, publications related to the dissertation, references and annexes. It contains 15 tables, 39 figures and photos and 155 titles are quoted, of which 66 are in Bulgarian language. The annexes present tables with data for the distribution of the areas of the genus *Ulmus*, as well as thematic maps with their location, selection characteristics of the sample plots and passports of plus trees. The dissertation was developed with a lot of data, both personal of the PhD student from field work and from official databases, and a mathematical analysis was made. The literature review is developed on 16 pages, structured with 5 subsections. The obtained results, their analysis, the formulated conclusions and recommendations are presented on 62 pages.

In the introduction the justification for the development of the presented dissertation and the topicality of the problem for the preservation of the representatives of the genus *Bryast* is developed. Chapter I sets out in detail, specifically and clearly the objectives and tasks. A hypothesis has been formulated, which derives from the literature review - One of the ways to preserve and improve the condition of the elm genetic fund is the selection of resistant to Dutch disease varieties and cultivars. To prove it, the main goal and 4 tasks are written. The development follows the logically scheduled tasks.

The dissertation is written in clear scientific language, concise style, with a logical sequence of the presented theses and the obtained results, as well as the formulated conclusions and recommendations.

### **3. Actuality of the topic.**

The proposed dissertation is related to the current scientific problem with important practical orientation, to make an inventory of the genetic fund of the genus *Ulmus* in our country and continue the work on selection of sustainable branches of the genus *Ulmus* in our country to ensure its preservation by methods *in situ* and *ex situ*. As an important task related to the professional activity of the PhD student is: Selection and differentiation of seed production plantations and elite trees for the National Register of the forest seed production base.

### **4. Literary awareness.**

A detailed review and analysis of literature sources directly related to the topic of the dissertation was performed. The literature review is divided into sections that follow the logic of the formulated goals and objectives:

- Phylogeny and taxonomy of the *Ulmus* family (Ulmaceae). Brief description of the representatives of the genus *Ulmus* in our country
- Area

- Ecological - silvicultural characteristics of the European *Ulmus* species and their distribution in our country
- Diseases and pests
- Scientific and practical programs related to the conservation of the genetic fund of *Ulmus* by *in situ* and *ex situ* methods

The PhD student demonstrates very good knowledge on the topic, a critical analysis of major authors and publications, as well as research programs implemented in many countries for the selection of sustainable branches of the genus *Ulmus*. The selection program in our country, the main researchers, works and results are also considered. The necessity of "renewal of the selection activity and elaboration of a strategy for increasing the forestry importance and preservation of the genetic fund of this autochthonous for our country tree species, by way of selection and selection of productive and resistant to diseases and pests elm cultivars" is substantiated.

#### **5. Aim, objectives, tasks and research methods.**

Chapter II presents a well-formulated goal of the present study and divides the tasks that are set for its achievement. I believe that the goals and tasks formulated in this way are clear and specific, which is the basis for a well-structured study.

Chapter III discusses in detail both the selected sites and the methodological approach and methods used in the developed topic. The sites are located in RFD Sofia, RFD Berkovitsa, RFD Lovech, RFD Veliko Tarnovo, RFD Ruse, RFD Shumen. A research methodology has been developed to study the variability and health status of the representatives of the *Ulmus* genus.

A carnet for characteristics and selection assessment has been drawn up (prepared on the basis of the requirements of Ordinance 21 on the terms and conditions for determining, approving, registering and revoking the sources from the forest seed production base, collecting and extracting forest reproductive materials, their qualification, trade and import) , which also complies with EUFORGEN requirements for genetic selection inventory of rare deciduous species (Jansen., 1997; Jochansen et al., 1988). This characteristic was performed on 28 experimental areas in the studied RFDs. For study, the ecotype and shape diversity of the field elm (*Ulmus minor* Mill.) and the white elm (*Ulmus laevis* Pall.) Were separated experimental areas and individuals were selected, applying mass and individual selection. The genetic - selection work and the assessment of the health condition of the elms were performed according to generally accepted methods, which are used in the Forest Protection Stations.

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

As a result of the conducted researches, results with an impressive volume were obtained. A complete inventory of *Ulmus* plantations in the studied RFDs was made. Thematic maps have been prepared. Data in addition to tables in applications could be visualized with more graphs.

Data on the diversity and variability of the bark, crown, branches, leaves, seeds - variability in terms of fruiting are presented by experimental areas.

The results and data analysis present figures and photographs that help to draw conclusions and recommendations.

In connection with the determination of the health status of the species of the genus *Ulmus* in permanent experimental areas, a complex assessment was performed based on the defoliation of

the trees and the discoloration of the leaves (Table 11), the presence of abiotic, biotic and anthropogenic damages. The comprehensive assessment showed that 38% were healthy, 48% of the plantations were slightly affected and 14% were moderately and severely affected by damage. The results show that Dutch disease occurs in almost the entire study area.

During the inspection of the sample areas it was found that one of the most characteristic abiotic damages, occurring in 50% of the observed sites, is the presence of frostbite. This damage is common not only in *Ulmus* spp., But also in *Quercus* spp. and *Acer* spp., as a prerequisite for its occurrence are moist soils, northern and eastern exposures, narrow river valleys and others. In most cases, elm grows precisely at such exhibitions, where damage is observed on the trunks of elm trees (Table 7 Appendix 1).

To accomplish the task of conserving the genetic resources of the genus *Ulmus* is elaborated in detail in Chapter IV. In the separate experimental areas and during the route inspections in the study area, plus trees have been identified and described, for each of which a passport containing its assessment and selection characteristics has been filled in. The distribution of the number of plus trees by species and RFD is shown in Table 8. A total of 170 trees of the genus *Ulmus* were selected for the territory of Northern Bulgaria, including 79 from *Ulmus minor* Mill, 51 from *Ulmus glabra* Huds. and 40 from *Ulmus laevis* Pall.

Studies related to ex situ conservation of the genetic fund by representatives of the *Ulmus* have also been considered. The possibilities for seed and vegetative propagation are considered in detail.

The results obtained in the study of in vitro reproduction of the representatives of the genus *Ulmus* are very interesting. in the tissue culture laboratory of FRI-BAS. The presented research confirms the thesis that the juvenile tissues of forest tree species are able to form a root system. The rooting of white elm shoots was also observed in the control variant, regardless of the statistically low results. A similar trend is observed in the in vitro provocation of the rhizogenic potential of white elm shoots. The obtained positive results show that their rooting reaches 60% for untreated, up to 100% for IBA-treated crops. The formation of the root system is the key stage for ensuring the polarization of the plant, which is a guarantee for the subsequent normal growth and development. However, this hypothesis can only be proven if modern biochemical and molecular methods are used that would expand and supplement the knowledge of genetic control over the rooting process. According to the study, it can be assumed that there is cell reorganization and cell division, leading to the initiation of root primordia and the formation of differentiated roots. In both approaches, exogenously administered auxin can induce cell differentiation and cell division, but does not always stimulate the organization and emergence of the root system - at best 12% in vivo and with a variation of up to 8.9% in in vitro cultures.

Chapter V systematizes the main conclusions that emerge from the research and the results that are analyzed. The conclusions are arranged logically, relating to the pre-formulated goals and objectives. Impressive are the very detailed recommendations that are formulated from the research in the dissertation, showing the many years of practical experience that the doctoral student has.

## **7. Contributions of the research**

I accept the contributions formulated, which are scientific - 1, 2 and 3; and 4 - 7 as rather scientific - applied. They reflect the results obtained in the development of the dissertation, have an original character and would contribute to better management of elm forests and their preservation by selecting more sustainable species. The results obtained by the PhD student and the formulated recommendations are very valuable when planning future silvicultural activities.

#### **8. Critical remarks and recommendations.**

I would like to give the following recommendations:

- The main recommendation is to strengthen the publishing activity in renowned scientific journals referenced or indexed in world databases. This will allow the PhD student to compare his scientific activity and the results he has received with colleagues from all over the world, and will also strengthen the opportunity to be quoted.
- There is enough data and results that can be presented in scientific forums and published. I believe that the PhD student should make more efforts to become more visible and better known among the professional guild as an author and researcher - there is many things to develop in the future based on the results obtained so far.
- Question - in your opinion, which is the publication you are most proud of?
- In some parts of the dissertation, especially in Results and Discussion, there are passages that should be in Object and methods.
- It is good when studying a local and specific problem to be considered as part of a larger one - this makes it possible to consider and understand the processes and interdependencies between the individual elements and the factors that determine them. In this connection, I would like to ask a question - do you think that there is any relations between climate change and extreme events with the emergence and extinction of such tree diseases as the Dutch disease.
- I have noticed some small technical errors and inaccuracies.

These comments and recommendations concern rather the future work of the doctoral student and do not reduce the value of the proposed work.

#### **9. Evaluation of the quality of scientific publications.**

Nikolay Stoyanov presented a list of 7 publications related to the topic of the dissertation, of which 4 as the first author and one in a collection of reports from international scientific forums in full text. According to the presented criteria and points, this exceeds the required minimum of 2 pcs. and 80 points, specified in the scientometric requirements for acquiring the educational and scientific degree "DOCTOR" in the Regulations of IG-BAS. My assessment of the quality of scientific publications is good.

#### **10. Personal contribution of the PhD student.**

Field research, measurements and data collection, their summary and analysis, as well as experimental work in the laboratory of FRI-BAS, are personal contributions of the PhD student. Together with scientific consultants and other colleagues, both from scientific institutes and from the Forestry Enterprises, he has developed the proposed dissertation and formulated conclusions and recommendations for the practice. This makes him ready to continue his scientific work on his own.

**CONCLUSION:**

Based on the different research methods learned and applied by the PhD student, the correctly performed experiments, the summaries and conclusions made, I believe that the presented dissertation meets the requirements of the Law and the Regulations on the terms and conditions for obtaining scientific degrees and holding academic positions in BAS, which gives me reason to evaluate it **POSITIVELY**.

I propose to the Scientific Jury to vote positively and to award to **NIKOLAI YANCHEV STOYANOV** the educational and scientific degree "**Doctor**" in the field of higher education 6. Agricultural Sciences and Veterinary Medicine, professional field 6.5. Forestry, scientific specialty "Forest plantations, selection and seed production"

Date: 13.09.2021

Member of the scientific jury:

(Assoc. Prof. Dr. Svetla Bratanova-Doncheva)