

ABSTRACT

of the dissertation work of Nurlabi Ainur on the topic: "Mycorrhizae *Pinus sylvestris* L. and *Betula pendula* Roth. in forest ecosystems of North-Eastern Kazakhstan" for the degree of Doctor of Philosophy (PhD) in the specialty 6D080700 "Forest resources and forestry"

Relevance of the topic. It is known that for centuries the life of mankind has been connected with nature. The territory of the Republic of Kazakhstan is 2.72 million km², ranks 9th in the world and occupies a unique set of landscape complexes from deserts to high mountains and ecosystems of the inland seas. In addition, arid and subhumid lands account for more than 75% of the country's territory. The flora of Kazakhstan includes more than 13 thousand species, including over 5,750 highly vascular plants, about 5,000 fungi, 485 lichens, more than 2,000 algae, and about 500 mosses.

The issue of nature protection in general or biodiversity conservation was raised in connection with the signing of the RIO 92 Conference by Kazakhstan in 1992. In connection with the topics raised at the conference, in pursuance of the decree of the first President "on measures to implement the strategy on the formation and development of Kazakhstan as a sovereign state" (07/15/1992) and the Decree of the Cabinet of Ministers of the Republic of Kazakhstan (No. 839 dated 07.10.92), a "national environmental management program" was developed in 1993. On the basis of this program, the UN Convention on Biodiversity of the Republic of Kazakhstan in 1994, Kazakhstan assumed international obligations aimed at preserving, modernizing and sustainable use of its rich biological diversity. Over the past decade, the Republic of Kazakhstan has taken a number of important steps to protect biological and landscape diversity and improve sustainable use. Among other things, the 1994 Convention on Biological Diversity was approved. As a result of the Convention on Biodiversity, nature reserves, reserves, and natural parks were formed in order to protect natural complexes. One of the most effective ways to preserve biological diversity has become a system of specially protected natural areas (protected areas). The purpose of the creation of the state natural reserves "Ertis Ormany" and "Semey Ormany" is: to stop the degradation of specially protected natural areas and rare, endangered species and ecosystems, to preserve the use of biological reserves.

The biodiversity of the forest ecosystems of the Yertis Ormany Nature Reserve is an important topic for the study and conservation of natural resources in this region. Ertis Ormany is a natural reserve located in Northeastern Kazakhstan, on the territory of the Altai Territory. The nature reserve was created to protect unique forest ecosystems and various species of plants and animals.

In this region, you can find rare and unique species of plants and animals that are not found in other parts of Kazakhstan. Some of them are endemic, which means that they inhabit only these areas. The Yertis Ormany Reserve has become an important educational facility for biologists and zoologists, as well as a place for scientific research on biodiversity conservation. The forests of the Yertis Ormany Reserve represent a unique biotope for various trees, shrubs and

herbaceous plants, which contributes to the diversity of vegetation. For a more detailed study of the biodiversity of Ertis Ormany and the development of measures for its conservation, scientific research is required from the state, society and scientific organizations. This will not only preserve the unique natural heritage of Kazakhstan, but also ensure the sustainable development of this region and the preservation of its natural resources for future generations.

However, like other nature reserves, the Irtysh forests face a number of threats, such as illegal logging, environmental pollution and climate change. Therefore, the preparation and implementation of measures for the protection and sustainable use of the reserve's resources to preserve unique biodiversity is an urgent issue.

Goal of the research: To study the effect of mycorrhizae on the growth dynamics of *Pinus sylvestris* L., *Betula pendula* Roth fungi. and the biological diversity of mycobiota in the forest ecosystems of Northeastern Kazakhstan

To achieve this goal, the following tasks were considered in the dissertation work:

1 Characteristics of the taxation indicators of forest plantations in the sample areas, the collection of pine and soil blocks in the projection of birch plantations in buffer and protected areas of forestry.

2 Determination of the diversity of macromycetes and creation of a collection of ectomycorrhizal fungi growing in sample areas in combination with the main forest-forming trees;

3 Determination of mycotrophy of scabby pine and birch and comparative analysis of morphometric indicators of adolescent development and mycorrhization index;

4 Application of molecular genetic methods to ectomycorrhizae forming a common community with *Pinus sylvestris* L. and *Betula pendula* Roth.

5 Determination of the granulometric composition of soils and the level of soil acidity in the sample areas;

The object of the research: The root systems, macromycetes and soil blocks of Scots pine (*Pinus sylvestris* L.) and hanging birch (*Betula pendula* Roth.) in the Shaldai and Beskaragai branches of the state forest natural reserve "Ertis Ormany" are considered.

The theoretical and methodological basis of the research work was the works of Kazakhstani and scientists of the Russian Federation, the USA, and European countries on the theory and practice of using the method for determining mycorrhiza and macromycetes (Vaishlya O. B., Veselkin D., Kudashova N.N., J.Trapp, Read. Smith, Agerer R., Lileskov, Abiev, Nam G.). The Forest Code based on the forest legislation of the Republic of Kazakhstan, official data of the Committee of Forestry and Wildlife of the Ministry of Ecology and Natural Resources of the Republic of Kazakhstan, annual reports of the Yertis Ormany Reserve, databases Index fungorum, Mycobank, DEEMY, NCBI, Mega programs were also used.

Scientific novelty. For the first time, a list of macromycetes capable of forming ectomycorrhiza in the Yertis Ormany reserve was compiled, work was carried out to determine the diversity of underground and terrestrial mycobiotes, types of morphotypes.

The main provisions submitted for protection:

1. Species composition of macromycetes *Pinus sylvestris* L. and *Betula pendula* Roth. growing in the protected and buffer territories of the Yertis Ormany Reserve
2. Morphotypic features of the root system of *Pinus sylvestris* L. and *Betula pendula* Roth.
3. Identification of the species identity of ectomycorrhizae *Pinus sylvestris* L. and *Betula pendula* Roth using DNA and species registered in the NCBI database.

The theoretical and practical significance. The list of macromycetes identified in the Irtysk Forest Reserve provides information about the mycobiotes of this area as a whole. In addition, many young scientists can use this data in their work, determining the types of ectomycorrhizal fungi using modern methods.

The research results of this dissertation are included in the educational process of the Department "Forest Resources and Forestry" of the Kazakh Agrotechnical Research University named after S. Seifullin in the discipline "Forest nurseries".

The results of the assessment of the impact of mycorrhizal fertilizers on seedlings of hanging birch and Scots pine were introduced into production in the Shaldai nursery of the Yertis Ormany reserve.

Connection of the dissertation with state programs. This dissertation work was carried out on the basis of a Memorandum of cooperation between the NJSK "Kazakh Agrotechnical Research University named after S. Seifullin" and SFNR "Ertis Ormany".(20.08.2020). The project "Mycorrhizal macromycetes of the main forest-forming trees of Central and North-Eastern Kazakhstan and their use for artificial mycorrhization of seedlings of woody forest species" was completed.

Personal contribution of the author. The author conducted all the research and results personally, as well as jointly with foreign and domestic consultants chose the direction and research program. The definition of field, laboratory, expert work, macromycetes, and analysis of the results were carried out with the personal participation of the author.

The validity of the conclusions and the degree of reliability of the results. To analyze the results of the research, soil samples, young undergrowth of pine, birch, and macromycetes from the test sites were collected. Identification of mycorrhizal fungi using DNA and BioEdit processing, introduction into the NCBI database, phylogenetic analysis of Mega, description of ectomycorrhiza in the root system of *Pinus sylvestris* L. and *Betula pendula* Roth fungi. DeeMy programs, analysis of macromycetes using Mycobank and Index Fungorum sites, the results of the data obtained were based on analyses of SPSS, MS Excel, Numbers.

Approbation of the research results. The results of the dissertation work related to the completed tasks are reflected at international scientific and practical conferences. V International Scientific and Practical Conference "Global Science and innovations 2019: Central Asia", (Astana, 2019), Youth in Science: New arguments: III International Youth Collection of scientific articles (Lipetsk, Russia, 2019), "Seifullin readings at the Kazakh Agrotechnical University named after S. Seifullin-18: international scientific-practical conference "Youth and Science -a

look into the future" (Astana, 2022); 1st International Scientific Conference» Research Reviews" (Prague, Czech republic. 2022).

Publication and approbation of dissertation materials. According to the scientific results of the work related to them-3 articles in international scientific publications based on Scopus basic data, 4 articles in publications recommended by the Committee for Quality Assurance in the field of education and science of the Ministry of Education and Science of the Republic of Kazakhstan; 2 articles in foreign publications, 5 articles in the materials of an international scientific conference. research work, 14 scientific articles have been published.

Scope and structure of the dissertation. The dissertation consists of an introduction, 4 chapters, a conclusion and 4 appendix. The list of references was 191, 20 tables, 23 figures revealing the content of the research work, the total amount of work is 103 pages typed by a computer.