MACROMYCETES DIVERSITY OF MTIRALA NATIONAL PARK IN ADJARA (GEORGIA)

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Abstract - Our study in the Mtirala National Park of Adjara (Georgia) began in 2022-2023 and included 50 surveyed sites. The Colchic Rainforests and Wetlands occupy the central part of the Colchic region, which in turn is part of the Caucasus region. The predominant vegetation consists of beech and oak forests, but also a forest of chestnut. The aim of the study was to identify and determine the composition of on different macroscopic fungi; A total of 215 macrofungal species species were recorded, of which 205 belong to the Basidiomycota phylum and 10 to the Ascomycota phylum. Fungal taxa of species were included in the study. Thera are 50 species are considered edible, 17 poisonous, while 148 species are inedible in the Mtirala National Park. We study 35 families, 64 genera, 215 species. The number of species next leading families are singled out: Russulaceae, Amanitaceae, Boletaceae, Strophariaceae, Agaricaceae. Richness genera are: Amanita, Lactarius , Russula. Understanding the diversity and ecological roles of macromycetes in the forests is crucial for conservation efforts and sustainable forest management practices. Continued research into these fungi will provide valuable insights into the functioning and resilience of beech and chestnut forest ecosystems in the face of environmental changes and anthropogenic disturbances.

Keywords - Macromicetes, Mtirala National Park, Forest, Fungy

I. INTRODUCTION

The Colchic Rainforests and Wetlands, situated in the central part of the Colchic region within the Caucasus, boast a rich tapestry of biodiversity. The primary vegetation includes beech and oak forests, along with pockets of chestnut forests. Indeed, fungi, particularly saprophytic ones, thrive in environments where woody plant residues are abundant. Their hyphae, the thread-like structures composing the fungal body, offer advantages over bacteria in certain soil conditions. For instance, in dry environments, fungi can bridge gaps between pockets of moisture, enabling them to survive and grow even when soil moisture levels are too low for most bacteria to remain active. Moreover, fungi possess the capability to utilize nitrogen from the soil, which allows them to decompose surface residues that are typically low in nitrogen content. This ability is significant for nutrient cycling within ecosystems. However, it's important to note that soil experiencing prolonged anaerobic conditions tends to lose its fungal component. Anaerobic conditions, often occurring in waterlogged or compacted soils, are detrimental to many fungi, leading to a decline in their populations. Understanding these dynamics is crucial for managing soil health and promoting sustainable ecosystems.

The prevalence of fungi in forest ecosystems is indeed notable, and their role in enhancing forest productivity is well documented. Fungi play various crucial roles in forest ecosystems, including nutrient cycling, decomposition, and symbiotic relationships with plants [Fig 1], [1]. One of the keyways fungi contribute to forest productivity is through their symbiotic relationships with plants, particularly through mycorrhizal associations. Mycorrhizal fungi form mutually beneficial partnerships with the roots of many plant species, facilitating the uptake of water and nutrients such as phosphorus and nitrogen. In return, the fungi receive carbon compounds from the plant host.

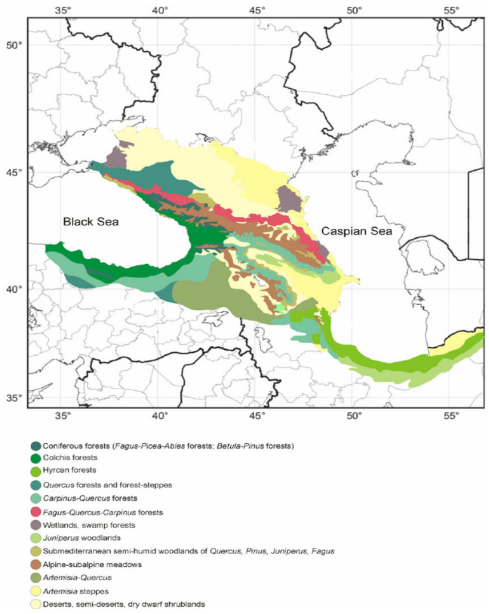

Fig 1 Vegetation map of the Caucasus region. Mainly after Beruchashvili (1995).

As fungal biomass increases in forest soils, especially through mycorrhizal networks, there tends to be a corresponding increase in nutrient availability to plants. This enhanced nutrient uptake can lead to increased plant growth and overall forest productivity. Additionally, fungi contribute to the decomposition of organic matter, releasing nutrients back into the soil and promoting soil fertility.

Therefore, the observed increase in forest productivity with an increase in fungal biomass underscores the vital role fungi play in maintaining the health and vitality of forest ecosystems. This highlights the importance of understanding and conserving fungal diversity in forest management practices.

The focus of the study we mentioned was to investigate and characterize the diversity of macroscopic fungi in this unique ecosystem. Macroscopic fungi, visible to the naked eye, play crucial roles in nutrient cycling, decomposition, and symbiotic relationships within forest ecosystems.

By identifying and understanding the composition of macroscopic fungi in the Colchic Rainforests and Wetlands, researchers can gain insights into the ecological dynamics of this region. Such studies contribute to broader efforts aimed at biodiversity conservation and sustainable management of forest ecosystems in the Caucasus region.

II. MATERIALS END METHODS

Our study in the Mtirala National Park of Adjara, Georgia, initiated in 2022-2023, sounds like a comprehensive endeavor. With 50 surveyed sites, it seems you aimed for a thorough examination of the fungal diversity within the park.

Surveying such a significant number of sites allows for a more comprehensive understanding of the distribution and composition of macroscopic fungi in the area. It also enables you to capture variations in fungal communities across different habitats and environmental conditions within the national park.

Studies like yours are instrumental in providing insights into ecosystem dynamics, biodiversity conservation, and the overall health of natural habitats. By documenting the fungal species present in Mtirala National Park, your research can contribute valuable data for future conservation efforts and management strategies aimed at preserving this biodiverse ecosystem.

The aim of the study was to identify and characterize the composition of macroscopic fungi in a specific area. The researchers recorded a total of 215 macrofungal species, with 205 belonging to the Basidiomycota phylum and 10 to the Ascomycota phylum. This indicates a predominance of Basidiomycota fungi in the studied ecosystem [Fig 2].



Fig.2 Mtirala National Park remark sample area fungi Species

It's noteworthy that the inclusion of fungal taxa from previous studies [2, 3] suggests a comprehensive approach to understanding the fungal diversity in the area, potentially providing a more robust dataset for analysis.

By documenting the species composition and distribution of macroscopic fungi, the study contributes valuable information to our understanding of fungal biodiversity in the region. Such insights are crucial for ecological assessments, conservation efforts, and management strategies aimed at preserving fungal diversity and ecosystem health.

Our study utilized a combination of standard light microscopy and scanning electron microscopy (SEM) techniques to examine fungal specimens collected from Mtirala National Park. The use of these microscopy methods allows for detailed visualization and analysis of the morphological characteristics of the fungi.

Specimens examined were deposited at HAL, KW, and TGM, which likely refers to specific repositories where the fungal specimens are archived for future reference and research purposes. This ensures that the specimens are available for further study and verification by other researchers.

Species identification was primarily based on morphological characteristics of single-spored isolates, as described in previous literature references (cited as [4, 5]). This approach is common in fungal taxonomy and identification, where specific morphological features of fungal structures are used to differentiate between species.

By employing these microscopy techniques and reference materials, your study aimed to accurately

identify and characterize the fungal species present in Mtirala National Park, contributing to our understanding of fungal biodiversity in the region.

The identification of fungi in your study was conducted using modern identification guides and relied on a combination of macroscopic and microscopic characteristics. Here's a breakdown of the process:

Macroscopic Characteristics: This involves observing visible features of fungal colonies grown in culture. Characteristics such as colonial morphology (the overall appearance of the colony), color, texture, and shape are examined. Colonial morphology refers to the shape, size, and overall appearance of the fungal growth on agar plates. Color can vary widely and can provide valuable clues for identification. Texture refers to the surface characteristics of the fungal colony, whether it's smooth, powdery, or filamentous. Shape and appearance of structures such as fruiting bodies or reproductive structures (if present) are also noted.

Microscopic Characteristics: Microscopic examination is crucial for detailed identification. Microscopic characteristics include features observed under a microscope, such as the septation (presence of cross-walls) in the mycelium (fungal hyphae), presence of specific reproductive structures like spores or fruiting bodies, and the shape and structure of conidia (asexual spores). The septation pattern, if present, can be indicative of certain fungal groups. Reproductive structures are often highly characteristic of fungal taxa and can aid in accurate identification. Conidia, which are asexual spores produced by fungi, come in various shapes and sizes, and can provide valuable diagnostic information.

Genus Level Identification: Based on the combination of macroscopic and microscopic characteristics, fungi were identified at the genus level. This level of identification provides a broad classification of the fungi, allowing for further investigation and comparison with known species within the genus.

By utilizing these modern identification techniques and criteria outlined in the references cited [6, 7, 8, 9,10], Our study aimed to accurately identify the fungi collected from Mtirala National Park, providing valuable insights into the fungal diversity of the region.

III. RESULTS AND DISCUSSIONS

Thera are 50 species are considered edible, 17 poisonous, while 148 species are inedible in the Mtirala National Park. We study 35 families, 64 genera, 215 species. The number of species next leading families are singled out: Russulaceae, Amanitaceae, Boletaceae, Strophariaceae, Agaricaceae. Richness genera are: Amanita, Lactarius , Russula.

Based on the information provided, here are some conclusions:

Edible, Poisonous, and Inedible Species: Out of the 215 species studied in Mtirala National Park, 50 are edible, 17 are poisonous, and 148 are inedible.

Family and Genera Diversity: The study covers 35 families and 64 genera. Among the leading families in terms of species count are Russulaceae, Amanitaceae, Boletaceae, Strophariaceae, and Agaricaceae [Fig 3].



Fig.3 „Amanita porphyria“, The sample was taken on May 10.2024 Mtirala National Park

Richness in Genera: The genera Amanita, Lactarius, and Russula are particularly rich in species within the studied context.

Ecological Insights: The presence of a diverse range of families and genera suggests a rich ecological environment within Mtirala National Park. This diversity is important for maintaining ecosystem balance and providing habitats for various organisms.

Potential for Further Research: The presence of numerous edible and poisonous species highlights the importance of further research into the ecology, distribution, and potential uses of these species, especially for conservation efforts and human safety.

Overall, the study provides valuable insights into the biodiversity of Mtirala National Park, emphasizing the

importance of conservation efforts and continued research in understanding and preserving natural ecosystems. The understanding of macromycetes diversity and their ecological roles in forests, particularly in beech and chestnut ecosystems, is fundamental for effective conservation and sustainable management practices. By delving into the intricacies of these fungi, researchers can uncover vital information regarding the functioning and resilience of these forest ecosystems in the context of both natural environmental changes and human-induced disturbances.

Continued research into macromycetes will offer valuable insights into several key areas:

Biodiversity Conservation: Detailed studies will help identify and preserve diverse fungal species within these ecosystems, contributing to the overall conservation of biodiversity.

Ecosystem Functioning: Understanding the ecological roles of macromycetes, such as their symbiotic relationships with plants, nutrient cycling processes, and decomposition activities, is crucial for comprehending the functioning of forest ecosystems.

Resilience to Environmental Changes: Insights gained from research can inform strategies to enhance the resilience of beech and chestnut forests against environmental stressors, including climate change impacts and habitat degradation.

Sustainable Management Practices: Knowledge about macromycetes can guide sustainable forest management practices by considering their importance in ecosystem health, soil fertility, and overall ecosystem services.

IV. CONCLUSION

In conclusion, ongoing research into the diversity and ecological functions of macromycetes in beech and chestnut forests is vital for both conservation efforts and the implementation of sustainable forest management practices. Such endeavors will contribute to the preservation of these ecosystems and their ability to adapt to changing environmental conditions and human pressures.

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