



Opportunities for the analysis of the spatial ecological structure of the mycobiota of macromycetes of a natural-territorial entity (the case of the Botanical Garden of Belgorod University, Belgorod, Russia)

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Abstract

Given piece of the research work was conducted in the seasons 2011-2018. The object of research was the mycobiota of macromycetes of the Botanical Garden of Belgorod State University (Belgorod, Russian Federation). The main subject of research was the spatial-ecological organization of the mycobiota of macromycetes. In the process of research, practical methods of direct observation from the mycocenological arsenal, theoretical-practical methods of analysis-synthesis, decomposition-composition and theoretical methods of correlating the abstract and the specific, and idealization were used. Based on the generalization of experimental data obtained in the course of practical studies of the spatial ecological organization of mycobiota of macromycetes carried out in the territory of the Botanical Garden of Belgorod State University, the principles of decomposition analysis of the structure of mycobiota of macromycetes of individual natural territorial entities are substantiated. A scheme of compositional construction of mycobiota of macromycetes is proposed, as well as a scheme in the form of a linear sequence showing the spatial ecological organization of mycobiota of macromycetes in a "pure form": mycobiota - mycochore (mycocenosis, mycoaggregation) - mycosynusia-3 - mycene cell - mycocell.

Keywords: spatial ecological structure (SES), mycobiota, macromycetes, natural-territorial formation (NTF), decomposition analysis, mycochore, mycosynusia

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INTRODUCTION

The study of the spatial ecological structure of biota (NTF) is an important direction in the study of biocenoses and ecosystems. The understanding of the patterns of formation of biota and biocenoses comes in the process of studying the spatial distribution and ecological connectivity of organisms of the same nature (for example, Mycota). Mycobiota is an indispensable block in the composition of the terrestrial biocenosis. The mycobiota (NTF) itself generally is not homogeneous and in its composition more particular mycobiota are distinguished, combining more similar representative species, the study of which is advisable within a single conceptual plan. A similar generality is represented by the mycobiota of macromycetes - fungi that have rather large fruit bodies visible with the naked eye. The purpose of this work was to clarify the general principles of the organization of the mycobiota of macromycetes SES and to construct a scheme of their spatial ecological structure that meets the clarified

principles. The Botanical Garden of the Belgorod University ("Botanical Garden") served as the model for SES. Tasks were set as follows. 1. To conduct practical observations during the periods of fruiting of different groups of macromycetes and to map their localization. 2. Formulate the principles of conceptual sequential decomposition of the structure of mycobiota. 3. To carry out decomposition analysis with an adequate description of linear and hierarchical substructures, components, elements and sub-elements. 4. To present the schemes of the general compositional construction of the mycobiota of macromycetes and the scheme of its spatial ecological organization.

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MATERIALS AND METHODS

Given piece of the research work was conducted in the seasons 2011-2018. The object of research was the mycobiota of macromycetes of the Botanical Garden of Belgorod State University (Belgorod, Russian Federation). The main subject of research was the spatial-ecological organization of the mycobiota of macromycetes. In the process of research, practical methods of direct observation from the mycocenological arsenal (Arnolds 1982, Dighton et al. 2005, Dunayev et al. 2014, Hawksworth and Mueller 2005, Mueller et al. 2004, Ottosson 2013, Safonov 2004, Storozhenko 2015), theoretical and practical methods of analysis-synthesis, decomposition-composition and theoretical methods of correlating the abstract and the specific, and idealization (Ushakov 2005) were used.

RESULTS AND DISCUSSION

On the territory of the "Botanical Garden" (hereinafter "BG") for the years of its formation with the participation of man and with his support, a unique species community has been formed, which is based on woody plants from different ecological-geographical zones. And, despite the existence within the BG the elements and even individual components of the local, but also - at its core - man-made, tree flora (plantation, forest-park planting), geographically and species-wise, it is something special, in a sense - its own, originally established ecosystem. BG biocenosis is of man-made origin and is intended as a complex formation. In its composition, heterogeneous anthropogenic biocenoses are distinguished, which are distinctly physiognomically and geographically distinct from each other: a forest-type biocenosis (forest-park planting of the natural flora sector), a tree-meadow biocenosis (arboretum of the dendrology sector), and an agro-meadow-tree biocenosis (section cultural and ornamental plants).

On the basis of direct observations and subsequent analysis, the principles of the conceptual decomposition of the mycobiota system of BG macromycetes were clarified. Based on the observed internal spatial ecological heterogeneity of the BG, the principle (1) of the territorial differentiation of mycobiota was formulated. Based on the observed ecological preferences of representatives of macromycetes (according to the timing of the fruit bodies), the principle (2) of ecological differentiation of mycobiota was formulated. Based on the observed pattern of coexistence of representatives of macromycetes in the territorial boundaries of a separate area, the principle (3) of the chorological differentiation of mycobiota was formulated. Based on the observed joint or separate occurrence of representatives of macromycetes species on a separate substrate-locality, the principle (4) of intrahorological component, elemental and sub-element differentiation of mycobiota was formulated. On

the basis of the observed species and ecobiomorphological heterogeneity of macromycetes, principle (5) of the constitutional differentiation of mycobiota was formulated.

According to principle (1), specific intraterritorial structures of BG mycobiota were identified: these are the mycobiota of BG sites that correspond to sectors of different conceptual purposes and bio morphological and ecological content: a sector of cultural and ornamental plants (No. 1) of a sector of dendrology (No. 2), a sector of the natural flora (No. 3). According to principle (2), specific mycocomplexes of macromycetes comprising BG mycobiota and mycobiotas of BG sites: xylotrophs (wood destroyers), symbiotrophs (mycorrhiza-forming agents), soil saprotrophs, humus saprotrophs, litter saprotrophs, coprophils, and saprotrophs, humus saprotrophs, litter saprotrophs, coprophils, and saprotrophs; It is worth noting that with a small variety of species and a rather rare occurrence of representatives of individual species, the myco-complexes, especially within the boundaries of individual sections, does not make sense.

According to the principle (3), mycochores, mycocenoses and mycoaggregations were distinguished. These are communities of approximately the same scale. Mycochore, by analogy with the phytochore (according to Rosenberg 2006), describes morphologically homogeneous territorial communities of macromycetes, similar in type of nutrition, within the boundaries of mycoplastic sections of the meso size. In the presence of coenotic connections between macromycetes, the mycochore is a mycocenosis; in the absence of coenotic connections, mycoaggregation, by analogy with phytoaggregation (according to Rosenberg 2006).

According to principle (4), the following components were singled out: - mycosynusia-cenogroups (mycosynusia-3); elements of mycocenocells; subelements - mycells of macromycetes. According to principle (5), the constitutional components of mycobiota were identified: mycosynusias -mycocenopopulations (mycosynusions-1), mycosynusias — combining ecobiomorphs (mycosinusions-2).

The results of our decomposition analysis of the organization of the mycobiota of BG macromycetes are shown in the diagrams shown in **Figs. 1** and **2**. These schemes can be regarded as an embodied concept of the compositional construction of mycobiota in the BG ecological space.

The main components of the organization of the mycobiota of BG macromycetes (see **Fig. 1**) in the spatial ecological aspect are mycochores (mycocenoses, mycoaggregations). Microcomplexes are the components of a predominantly ecological organization. Mycosynusia-2 and mycosynusia-1 are the constitutional elements of the organization. In turn, the main components of the organization of mycochore

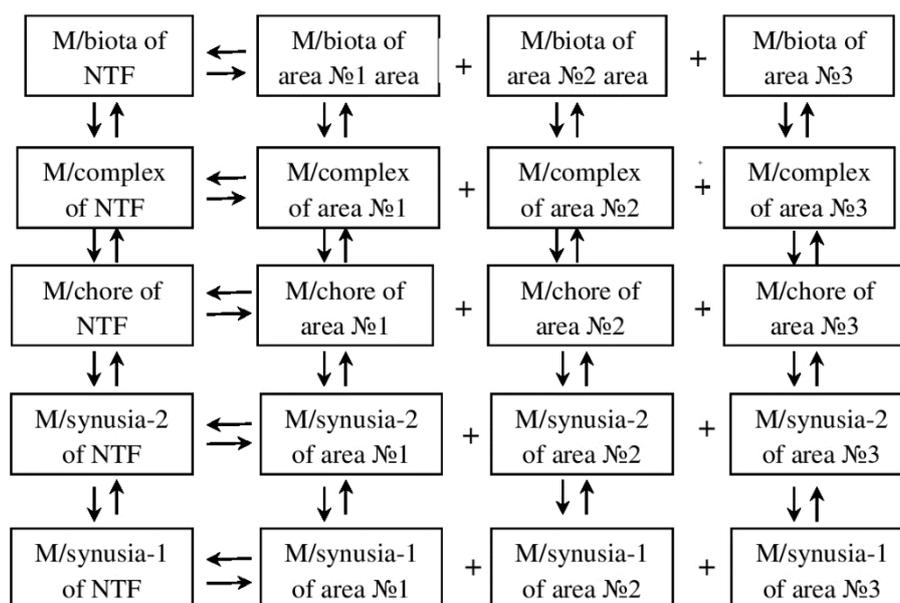


Fig. 1. Organization of BG mycobiota macromycetes

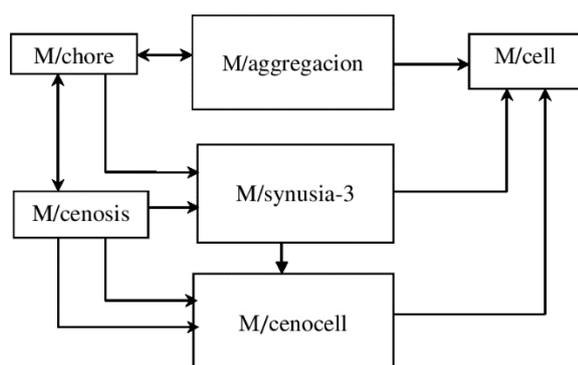


Fig. 2. Organization of BG mycochores (mycocenosis, mycoaggregation) macromycetes

(mycocenosis, mycoaggregation) (see **Fig. 2**) in the spatial ecological aspect are mycosinus-3, consisting of elementary mycocenocells. At the same time, individual mycocells act as subelements of the spatial ecological structure of the mycochore

(mycocenosis, mycoaggregation). Thus, the spatial ecological organization of mycobiota of BG macromycetes in its “pure form” can be represented in the following linear sequence: mycobiota - mycochore (mycocenosis, myco-aggregation) - mycosynusia-3 - mycocenocell - mycocell.

CONCLUSION

On the basis of direct observations, the general principles of the organization of the mycobiota of the macromycetes of the natural-territorial formation “Botanical Garden” of Belgorod State University (Belgorod, Russian Federation) have been clarified. Based on the clarified principles, a scheme of their spatial ecological organization has been constructed: mycobiota - mycochore (mycocenosis, mycoaggregation) - mycosynusia-3 - mycocenocells - mycocell. The obtained results can be used to study the spatial ecological organization of mycobiota macromycetes of other natural-territorial formations.

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