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Wood-destroying Basidiomycetes, found on the elder woods in the South Urals (Orenburg Oblast, Russia)

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Abstract

The article shows the results of a study of wood-destroying basidiomycetes on two species of elder trees (Alnus glutinosa, Alnus incan), growing in the South Urals (Orenburg Oblast). The comparative analysis of basidiomycetes on two species of elder trees was conducted. The reasons for structural differences of these complexes are discussed. It is consumed that the reason lies in growth conditions of the trees.

Keywords: basidiomycetes; species diversity; mycocenosis; alder tree; Alnus glutinosa; Alnus incana; the South Urals.

Introduction

From a systematic point of view, wood-destroying macromycetes is a diversified group. The combining element for it is its throphism, meaning the ability to exist on dead fallen woods, dry woods and vegetative woods, which is fed through degradation of cellulose wood wool, and specific ferments.

Within the trophism group, we identify the species of different degrees of substrate specialization, adapted to wood decomposition with different physical and chemical properties. For macromycetes, the throphic specialization is identified through its frequent occurrence on various substrates (vegetative trees, fallen trees, stumps. [9]. The ferment complexes mainly indicate the specialization of macromycetes and they ability to exist on woody plants. And in most of the cases, specialization is possible for a certain woody plant. This mostly refers to oak trees. (*Fomitoporia robusta (P.Karst.) Fiasson & Niemela, Inocutis dryophila (Berk.) Fiasson & Niemela* and others.), *Piptoporus betulinus (Bull.:Fr.) P.Karst.* can be found met on birch trees, *Pleurotus* and other species of macromycetes exist oak and poplar trees. It's hard to say whether association of all these macromycetes is interrelated with their fermentative complex or growth conditions of woody plants where they live.

We can pup forward a suggestion that on the woods of allied plant species living in the same conditions, a general complex of wood-destroying macromycetes must be formed. This is mostly applicable to woody plants, growing in floodplain areas.

The object of our study were the macromycetes found on two species of alder trees – *Alnus glutinosa (L.) Gaertn.* и *Alnus incana (L.) Moench*, growing within the limits of the Orenburg Urals. European alder (Alnus glutinosa) forms pure forests in floodplain areas and shallow waters. [3]. In general, these are wet and damp black alder sudubravas with I-II AV quality grades. In floodplain areas, the AV quality grade is little bit lower. There are also alder forests in the steppe part of the oblast. The black alder forests are considered as a relic element of the oblast's plant cover. [5, 11]. In the North-West regions, the black alder is jointed by the gray alder (Alnus incana).

Materials and methods used

Within the framework of this study, the research on species composition of wood-destroying macromycetes in the South Urals between 1994–2013, was conducted. The project areas included alder forests in different regions of Orenburg oblast and the republic of Bashkortostan (pic. 1).

Picture 1. Location of researched alder forests.

1 – Alnus glutinosa; 2 – Alnus incana

The sample collection was conducted through shore-based surveys. On the route, they performed the description of biotopes, vegetation and substrates on which the macromycetes lived. As a model, the substrate unit was taken. Around 500 samples were collected in total. All collected samples are stores at the department of general biology, ecology and teaching methods of biology science of Orenburg State Pedagogical University. The identification of collected samples was conducted with the use of the Russian and foreign literature. [1, 2, 9, 12-16].

During description, the system of higher macromycetes published in the "Nordic Macromycetes" book, was used [13, 14].

Results and Discussions

During the study, around 489 fruit plants and 14 sports were found and identified as 73 species, which refer to 47 varieties and 29 macromycetes families. For these species, the alder wood is (*Phellinus alni (Bond.) Parmasto, Pholiota alnicola (Fr.) Sing*.), as suggested by the titles of the species. As for the other species found on the wood of both kinds of alder trees are widespread in the region and can be found on the wood of a wide range of woody plants (*Cerrena unicolor (Bull.:Fr.) Murrill, Fomes fomentarius (L.: Fr.) Fr., Fomitopsis pinicola (Sw.:Fr.) P.Karst., Irpex lacteus (Fr.:Fr.) Fr., Stereum, Trametes* and others) [6]. Findings of some species, in particular *Auricularia mesentarica (Gmel.:Fr.) Pers., Exidia glandulosa (Bull.:Fr.) Fr., Pleurotus, Polyporus,* are probably explained not so much by the substrate factor, but the conditions of back swamps with high wetting as they are found on the floodplains, dead woods, elm trees and other species of trees.

In terms of general bio-diversity, species grown on the woods of black and grey alder trees significantly differ (table. 1).

Table 1: Taxonomic structure of macromycetes, associated with alder trees in the South Urals

Alder species	Number of		
	species	genuses	families
Alnus glutinosa	51	23	21
Alnus incana	45	33	24

Below is the alphabetical list of the discovered wood-destroying fungi with an indication of their incidence on the wood of one or another species of alder in the South Urals (Table 2).

Table 2: Wood-destroying fungi, affecting the wood of alder trees in the South Urals

Species	Alder species	
	A. glutinosa	*A. incana*
Antrodiella hoehnelii (Bres.) Niemella		+
Antrodiella parasitica Vampola	+	
Auricularia mesenterica (Gmel.: Fr.) Pers.	+	+
Bjerkandera adusta (Willd.: Fr.) P.Karst.	+	
Ceraceomyces eludens K.H.Larss.		+
Ceriporia reticulata (Hoffm.: Fr.) Domanski	+	
Cerrena unicolor (Bull.: Fr.) Murrill	+	+
Chondrostereum purpureum (Pers.: Fr.) Pouzar	+	+
Coniophora puteana (Schumach.: Fr.) P.Karst.		+
Crepidotus mollis (Schaeff.: Fr.) Kumm.	+	+
Daedaleopsis confragosa (Bolton: Fr.) Schroet.	+	+
Daedaleopsis septentrionalis (P. Karst.) Niemela		+
Daedaleopsis tricolor (Pers.) Bond. & Sing.		+
Datronia mollis (Sommerf.: Fr.) Donk	+	
Datronia stereoides (Fr.: Fr.) Ryvarden	+	
Exidia glandulosa (Bull.: Fr.) Fr.	+	+
Flammulina velutipes (Curt.: Fr.) Singer	+	
Fomes fomentarius (L.: Fr.) Fr.	+	+
Fomitoporia punctata (P.Karst.) Pilat	+	+
Fomitopsis pinicola (Sw.: Fr.) P.Karst.	+	+
Ganoderma lipsiense (Batsch.) G.F.Atk.	+	
Gloeocystidiellum luridum (Bres.) Boidin		+
Gloeoporus dichrous (Fr.: Fr.) Bres.	+	+
Hericium coralloides (Scop.: Fr.) Pers.		+
Hymenochaete tabacina (Fr.) Lev.	+	
Hyphoderma litschaueri (Burt.) J.Erikss. & A.Strid	+	
Hyphodontia arguta (Fr.) J.Erikss.		+

Hyphodontia flavipora (Berk. & M.A. Curtis ex Cooke) Sheng H. Wu		+
Hyphodontia radula (Pers.: Fr.) E.Langer & Vesterholt	+	
Hypholoma capnoides (Fr.: Fr.) Kumm.		+
Hypholoma fasciculare (Huds.: Fr.) Kumm	+	
Hypochniciellum ovoideum (Julich) Hjortstam & Ryvarden		+
Hypochnicium erikssonii Hallenb. & Hjortstam		+
Inonotus radiatus (Sowerby: Fr.) P.Karst.	+	
Irpex lacteus (Fr.: Fr.) Fr.	+	+
Lentinus tigrinus (Bull.: Fr.) Fr.	+	
Oxyporus corticola (Fr.) Ryvarden	+	+
Paxillus panuoides (Fr.) Fr.		+
Peniophora violaceolivida (Sommerf.) Massee		+
Phellinus alni (Bondartsev) Parmasto	+	
Phlebia martiana (Berk. & M.A.Curtis) Parmasto		
Phlebia radiata Fr.	+	
Phlebia tremellosa (Schrad.: Fr.) Burds. & Nakasone		+
Pholiota alnicola (Fr.) Sing.	+	+
Pholiota aurivella (Batsch: Fr.) Kumm.	+	
Pholiota squarrosa (Weig.: Fr.) Kumm.	+	
Pleurotus ostreatus (Jacq.: Fr.) Kumm.	+	
Pluteus tomentosulus Peck.	+	
Pluteus umbrosus (Fr.) Kumm.		+
Polyporus arcularius Batsch.: Fr.		+
Polyporus badius (Pers.) Schw.	+	
Polyporus brumalis (Pers.: Fr.) Fr.	+	+
Polyporus ciliatus Fr.: Fr.	+	+
Polyporus squamosus Huds.:Fr.	+	
Polyporus tuberaster (Pers.) Fr.	+	
Porostereum spadiceum (Pers.: Fr.) Hjortstam & Ryvarden	+	+
Schizophyllum commune Fr.: Fr.	+	+
Steccherinum nitidum (Pers.: Fr.) Vesterholt	+	
Steccherinum ochraceum (Fr.) Gray	+	
Stereum hirsutum (Willd.: Fr.) Gray	+	+
Stereum subtomentosum Pouzar	+	+
Thelephora terrestris Ehrh.: Fr.	+	
Trametes gibbosa (Pers.: Fr.) Fr.	+	
Trametes hirsuta (Wulfen: Fr.) Pilat	+	+
Trametes ochracea (Pers.) Gilb.& Ryvarden	+	+
Trametes pubescens (Schumach.: Fr.) Pilat	+	+
Trametes trogii Berk.		+
Trametes versicolor (L.: Fr.) Pilat		+
Trichaptum pargamenum (Fr.) G.Cunn.	+	

The index of the similarity of the species composition of Sorensen-Chekanovsky is 48 %. This brings us to the conclusion that the singularity of the compared complexes is rather high.

The species, affecting only the black alder and the grey alder are of special interest. Among the species, discovered only on the wood of the black alder, we should note *Hyphoderma litschaueri (Burt.) J.Erikss. & A.Strid, Lentinus tigrinus (Bull.: Fr.) Fr., Pholiota aurivella (Batsch: Fr.) Kumm.*, which were found in the singular number and only on alder trees; *Inonotus radiatus (Sowerby:Fr.) P.Karst.* are typical species for black alder woods of the region. Some species (*Flammulina velutipes (Curt.: Fr.) Sing., Ganoderma lipsiense (Batsch.) G.F.Atk.*) are generally typical for broad-leaved forest of the South Urals [8].

Gloeocystidiellum luridum (Bres.) Boidin, Hypochniciellum ovoideum (Julich) Hjortstam & Ryvarden, Hypochnicium erikssonii Hallenb. & Hjortstam, Phlebia martiana (Berk. & M.A.Curtis) Parm were singly discovered on the wood of the grey alder only. *Hericium coralloides (Scop.:Fr.) Pers.*, listed in the Red Book of the Orenburg Region [7], was discovered on the windfall of the grey alder in the vicinity of Selo Tashla of Tulgansk Region.

Other species of fungi, which existence differentiate the complexes of species, affecting the wood of different species of alder, are not stenotrophic of alder and are frequent at small-leaved species of the region [8].

The comparative analysis shows that the reason of the greater similarity of the species composition of mycocenosis of black alder woods is the existence of the significant amount of species, specific for alder woods, which also act as the dominants of the community of species. *Inonotus radiatus* dominated in 6 of 9 studied black alder, *Phellinus alni* or unspecialized species – in grey alder, primarily *Fomitopsis pinicola*.

It can be assumed that such distinctions can in some way be detected by the state of the studied stand of trees – the presence and the amount of the dead fallen wood, dead and/ or wounded trees. But the comparison of substrata colonization shows that it slightly differs in the alder woods of different types (Table 3).

Table 3: Distribution of fungi, depending on the substrata state

Species of alder	Substrate state			
	Dead wood (brushwood, windfallen)	Dry trees	Growing trees	stumps
Alnus glutinosa	46	16	8	6
Alnus incana	37	24	4	1

Conclusions

To summarize the above, we can conclude that complexes of wood-destroying fungi, formed on the alder wood of different tree species, have some noticeable differences. This is more applicable to complexes associated with black alder forests. The reason for the difference is probably is not so much in the chemistry of wood of two alder species, in growth conditions and geographical location.

Based on the above data, it is possible to formulate the practical guidelines for preserving the diversity of mycobiota of the region and, in particular, formation mycobiota of alder forests. Special attention should be paid to the complex species associated with black alder trees, which feature a substrate-specific species. The separate grey alder forests in which rare species of fungi were marked are also deserve attention.

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