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Characteristics by the species compositions and biological activity of Xylomycobiota of some trees included in the flora of Azerbaijan

Muradov P.Z., Garayeva S.C., Naghiyeva S.E., Abasova T.S., Bakshaliyeva K.F., Alibeyli N.S*.

Institute of Microbiology of the NAS of Azerbaijan, Baku.
*Azerbaijan State Pedagogical University

Abstract

In the carried out of researches was identified that 75 species of xylotroph macromycetes distributes on the various natural and artificial forests, gardens and parks of Azerbaijan and about 120 strains of them were taken to the pure culture. During testing toxic activity of cultures were determined that 75th of them do not have toxic activity and vegetative mycelium and cultural medium are rich in biological activity metabolites.

Keywords: trees, xylotroph macromyclets, species, toxicity, biological activity, metabolites.

Introduction

Forests, which is an important component of the biosphere have an important function like as a complex unity of mutual relationship of populations of different species with each other and with lifeless objects and lungs of our planet. While the nature of Azerbaijan Republic is rich and colorful it includes in the list of less forested countries and only 10.4% of its territory is covered with natural forest [7]. Although the vegetation of these forests is made up of various plants there trees are permanent and numerous components of forests [3]. These trees, also other living things, primarily xylotrophic macromycetes are characterized as one of the places of feeding and nowadays, more than 200 species of xylotropic macromycetes were found in the forest ecosystems of Azerbaijan [9-10].Their synthesis of BAS and the expediency of using it also have been confirmed in researches [2, 12], however, in generally is not encountered application of the obtained results in the practice. Firstly this are due with minority of checked fungi and on the other side with the active producents selected as the BAM producer which does not always respond to the required criteria. All of this once again confirms actuality to study xylotrophic macromycetes, namely their potential as a BAS [4] producer in the ecological-physiological, biochemical and biotechnological aspects.

Therefore, the purpose of the presented work were to explore the xylotrophic macromycetes spread in the territory of Azerbaijan by species composition and as a potential producer of biological active items.

Materials and Methods

Samples for researches were taken from natural and artificial forests, gardens and parks located in the ecologically different regions of Azerbaijan (Greater Caucasus, including Absheron Peninsula, Kur-Araz Plain and Lankaran-Astara). During taking samples was used method of planed route. Taken samples, more exact fruit bodies (FB) of fungi was passported in place and were determined other symptoms (microscopic symptoms) for the identifie in laboratory conditions. During identification of fungi were used determinants compiled based on makroscopic and microcopic features.

Obtaining pure cultures of fungi was carried out by known methods in agarized cereal juice (3^0B). During estimate of fungi as BAS produce cultivation was carried out for 5 days under deep cultivation in glucose-peptonic nutrient medium [8, 11]. After the incubation period is over formed biomass is separated from the solution with the help of centrifuges. The obtained biomass (OB) and cultural medium (CM) were studied as BAM producents.

During evaluating fungi as a BAS producent were used approaches method used in the work of different authors [5, 13].

In the course of the research all experiments were conducted at least 4 times, the results statistically processed [6] and were used only correct results.

Results and Discussion

As a result of the analysis of FB taken from the natural and artificial forests as well as from the trees of gardens and parks of Azerbaija, became clear that 75 species of xylotrophic macromycetes spreads in the studied areas which some information about their taxonomic affiliation were summarized in the Table 1.

Table 1 Taxonomic structure of xylotroph macromyses recorded in the study area

Family	The number of genus	The number of species
Polyporaceae	10	25
Hapalopilaceae	3	5
Hymenochaetaceae	2	17
Physalacriaceae	2	2
Fomitopsidaceae	2	6
Pleurotaceae	1	3
Peniophoraceae	1	3
Ganodermataceae	1	3
Schizophyllaceae	1	1
Stereaceae	1	2
Tricholomataceae	1	1
others	4	7

During determination of other parameters about of recorded fungi became clear that, they are characterized by certain diversity in the all aspects. So that, 70,7% of registered fungi species in natural conditions is causes white colour rot, in 73,3% the life period of formed basidioma is one year, 82,7% is evritroph by distribution on substrate, 80% is polytrophs by ecologic-trophic relationships. This diversity is also showing itself on the hyphal system of fungi, so that 6,7% of fungi formes monomitic, 48,0% dimitic and 45,3% trimetic hyphal system.

Has not been sufficiently studied mechanism of connection between separate components that creator this diversity in the xylotrophic basidiomycetes, which has such diversity in different aspects. These creates certain difficulties in terms of full and effective utilization of the potential of fungi as the producent of BAS. Therefore, the main focus of the study of xylotrophic macromycetes was directed to clarification the role of components create diversity in the formation of potential as a BAS producent which in the course of studies we were tried to explain these issues.

It should be noted that the development cycle of basidium fungi occurs in three stages, which is the formation of monocarion, dicarion and fruit body. Each of these stages continues for a definite period, only the FB formation phase becomes available for a specific period of time. At the other stages, more accurate vegetative mycelium (VM) phase is termless and any time is possible to gets any amount of biomass from the VM. Currently, for obtain BAS from basidium fungi is used its every 3 stages. There is only one reason for that, any BAS meets in the all 3 instances. Therefore, was found method to cultivated FB of some fungi in the artificially created conditions but for many xylotrophic macromycetes this approach has not been solved yet. Thus, their FB used when they forms in natural environment. Although it has great resources it is formed at certain times of the year. Some of them destructs after a short time, and for this reason, it is not possible to get them at any time. VM is possible to get any quantity and at any time of the year. For this reason for the evaluation of fungi, such as BAS producents were used VM and this time for investigate mycelium to stage mono or dicarion is difficult in practical terms and disadvantage by economically, for that evaluation was base according to the mycelium combination in two phases For this purpose, fungi strains taken to the pure culture firstly were cultivated in the conditions of deep cultivation in glucose-peptonic nutrient medium (GPNM) for 5 days at the 26-28^{0}C. After the end of the process formed biomass was separated from the culture medium and both of instance were researched by BAS. For this purpose, obtained biomass was extracted both with water and alcohol, and analyzed for the intended purpose.

It is known that in researches conducted in this direction firstly determines the toxicity of biomass [5] as well as of CM of fungi that this issue was clarified in our research too. From the results, obtained in relation to invertebrate animals(*Tetrahymena pyriformis,Paramecium caudatum*) became clear that between the fungi strains that were taken to pure culture is having strains which has toxic and non-toxic activity. So that, in the 75 strains from120 which were taken to the pure culture was not found toxicity. It has been found that among other strains 30 strain have weak and 15 strain strong toxicity(tab. 2). As seen, in the variants that do not have toxic activity observed increase compare to control and the highest increase derives in the alcohol extract of vegetative mycelium. This fact allows us to say with certainty that in the biomass as well as in the cultural medium of fungi has metabolites with biological activity. Due to the fact that this situation was proven itself in the every 3 instances in the next stage were selected strains that have not toxic activity. At the time of selection were not selected all strains, selected only that strains such as *Ganoderma lucidum* S-45, *Laetiporus sulphureus* S-64 and *Pleurotus ostreatus* S-103 which shown maximum increase in the each of 3 instances.

Table 2 Toxic activity of strains xylotrophic macromycetes taken to the pure culture to the *Tetrahymena pyriformis*.

№	Toxic activity	The number of primary cells (cell/300 mkl)	The number of cells after 24 hours (cell/mkl)	Increase coefficient
Water				
1	Not having toxic activity	165-170	470-505	2,76-3,06
2	Having less toxic activity	130-160	130-150	-1,07- 0
3	Having toxic activity	150-160	100-107	-1,5
4	water	145	180	1,24
Alcohol (1%)				
1	Not having toxicity	156-174	418-437	2,40-2,80
2	Having less toxic activity	134-154	139-147	(-1,09)- 0
3	Having toxic activity	149-164	121-129	(-1,36)-(1,27)
4	alcohol	138	195	1,41
CM				
1	Not having toxicity	153-174	300-340	1,72-2,21
2	Having less toxic activity	154-163	140-158	(-1,05) - 0
3	Having toxic activity	143-157	119-133	(-1,32) – (-1,18)
4	GPNM	147	218	1,48

Thus, as a result of conducted researches was identified that in the formation of microbiota of trees grown on the natural and artificial forests, green zones, gardens and parks at the different parts of Azerbaijan participate 75 species of fungi, from that only 45 species have this or that extent of toxic activity. It was clear that, 75 strains which have not toxic activity, especially culture medium and vegetative mycelium of *Ganoderma lucidum* S-45, *Laetiporus sulphureus* S-64 and *Pleurotus ostreatus* S-103 are rich metabolites with biological activity.

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