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Mycological assessment of soil according by the response reaction to the anthropogenic impact

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Abstract

The purpose of the presented work was dedicated to the research of fungi involved in the formation of mycobiota of the same type of soils according to the response reaction to the different anthropogenic effects. From the carried out of research became clear that in the formation of mycobiota of soils affected to the different anthropogenic impact involves 81 species of fungi and in all cases, anthropogenic effects cause a reduction of species diversity compared with mycobiota of relative clear soils. The recorded fungi differ by the response reaction to anthropogenic effects, more accurately not found those inhibited in soil contaminated with oil and oil products and those activated by induction in relatively clean soil. Those who neutral reaction to the anthropogenic effect and activated can be spread in all areas with different quantitative indicators (5-21 species).

Keywords: gray-brown soils, anthropogenic impact, mycobiota, response reaction

Introduction

Environmental pollution is a complicated process that results in people's activities. Although anthropogenic pollution is strange for natural ecosystems, various contamination that accumulates in ecosystems destroys energy and metabolism, reduce production capacity, and adversely affects human health.

Pollution is a violation of the formed structure of natural habitat with mixed products over many years which this process can be with anthropogenic and natural natures [10]. Anthropogenic effects are caused by human activity, but natural ones, as a result of processes occurring in nature itself. Contamination is caused by activities of human used of production, agriculture, motor transport. The proportion of this or other contamination varies depending on the regions [9]. Attention to the solution to such problems has become more urgent for that the rise in the number of population in different regions of the world, leads to the increase of harmful resources of production facilities. For the solution of all these problems, one of the important issues is a development measure aimed [2] to protect environmental protection, to stabilize and improve soil productivity. Thus, conducting strengthening monitoring activities [15, 17] and detailed research is crucial to solving problems for the protection of natural cover of ecosystems and restoration of disorders land.

One of the environments that affect to the anthropogenic impact is soil which is also a place of residence for many living things, primarily microorganisms [1]. The main feature of the soil where inhabited microorganisms are that soil not only a place of residence of homogenous microorganisms, including fungi but also a mixture of different species, a micro- and mezo-zon environment.

In the formation of mycobiota of soils exposed to various anthropogenic impacts involves species of fungi characterized by a wide variety and this diversity is manifested to their ecology-trophic relationships, prevalence rate and so on features[5]. Results obtained from several types of research also allowed us to note the negative characteristic of this distinction, more precisely diversity which is largely dependent on the character of anthropogenic influences[10]. Besides, continuous updating of the technologies applied by people is also reflected in environmental impacts. Always taking in the attention of happened, also the identification of response reaction of living things spread in of this environment to the anthropogenic impact is one of the issues that paid attention and crucial today.

The purpose of the presented work was dedicated to the research of fungi involved in the formation of mycobiota of the same type of soils according to the response reaction to the different anthropogenic effects.

Materials and Methods

The research was carried out on the gray-brown soils of Absheron, affected by various pollutants (oil and oil products, chemical production products, motor transport waste, etc.). In the sampling process, were used from stationary experience areas, for this purpose, everywhere has been selected areas with 100x100m and samples were taken from 10 territories of every those areas.

A sampling of soil, preparation for laboratory analysis, characterization by the species composition of mycobiota of taken samples has been implemented based on mycology and microbiology methods and approaches currently used for this purpose [3-4, 12].
Identification of species composition of fungi taken to the pure cultures from soil samples was carried out based on the cultural-morphological and physiological signs of fungi, the naming of the fungi was carried out according to the international principles currently used [8, 11, 14]. The naming of fungi was carried out in accordance with the principles and approaches to the international nomenclature [6-7].

Results and Discussion

Today, soils are characterized as one place where all types of biodiversity are kept, lived and fed. However, depending on the local conditions the soil is also characterized by the different chemical composition and structural elements [5]. Therefore, the research of soils as an ecosystem is necessary for studying the essence of the processes occurring there, as well as eliminating negatively cased emerged from the ever-increasing technogenic and anthropogenic impact on the soil. Taking this into account, firstly in the course of research was considered reasonable to assess the biotas of fungi of gray-brown soils that differed by the character of anthropogenic impact on the Absheron Peninsula. For this purpose were selected 7 areas (Contaminated by production products, irrigated, oil and oil products, soils polluted by the impact of motor transport, urban soils, territories used for garbage disposal and relatively clean soil) at the gray-brown soils affected by the various influences in the Absheron. As a result of analysis of samples taken from selected areas determined that in the formation of mycobiota of these soils is generally involved 81 species of fungi of which 10 (12.3%) of registered fungi belongs to the department of Zygomycota, and 71 species (87.7%) to the Ascomycota.

The distribution of fungi species recorded in the research on separate areas affected by the anthropogenic impact is different however, the number of fungi species registered in all cases is relatively low compared to the relative soil. This case reveals itself at the highest level in the soils polluted with oil and oil products. The essence of this fact, that is being a different number of species involved in the formation of mycobiota of soils exposed to different anthropogenic influences at the same time a matter of interest in their effect or does not affect on the response reaction in each biotope. Therefore, this issue has also been clarified in the course of the research. For to move to the presentation of received results is necessary to clarify some points. This is due to the approach used to the response reaction to anthropogenic effects. Thus, for this purpose uses different approaches of which in the course of our research was also advisable to use the following system in the course of the research[16]. According to this system, the soil fungi are divided into 4 groups according to their response reaction to the pollutants' effect, and their characteristic features are given in table 1.

Table 1 Systematization of fungi according to the response reaction to the anthropogenic impact

№	Groups	Characteristic signs
1	Inhibitory	Here include more sensitive species of fungi, which also dominates or often found in the clean, more precisely in the background soils.
2	Neutral reactions giving	Sustainable species of fungi which dominates and frequently encountered species of both contaminated and clean soils.
3	Activated	Includes those fungi which development is accelerated by the presence of xenobiotics or pollutants in the soil.
4	Activated by induction	Induced species are those fungi that not found in clean soils, but are dominated or frequently encountered in the polluted soils.

When characterizing of these fungi recorded during research by this group became clear that in the soils polluted with oil not found fungi belonging to the I group (*Actinomucor elegans, Alternaria chlamydospora, Chaetomium cellulolyticum, Chrysosporinum merdanum, Gliocladium roseum, Trichoderma asperellum, T.hamatum* and *T. harzianum*), in the relative clean soils fungi belonging to the IV group (*Aspergillus flavus, Botrytis cinerea, Chaetomium globosum, Cladosporium herbarum, Fusarium moniliforme, F. solani, Humicola gricea, Mucor hiemalis, Penicillium brevicompactum, P.cyclopium, P.oxalicum, Stachybotrys chartarum, Torula herbarum, Verticillium alboatru*m) tab.2. In generally, on anthropogenic affected soils compared with relatively clean soils on the number of fungi are observed increase from the group II (*Aspergillus candidus, A.niger, A.ochraceus, A.versicolor, Aureobasidium pullulans, Circinella circinans, Cladosporium cladosporioides, M.mucedo, P.chrysogenum, Rhizopus nicricans, Stachybotrys chartarum, Trichothecium roseum* etc. total 25 species) to the group of III (*Absidia coerulea, Acremonium atrogriseum, Alternaria alternata, Botryotrichum piluliferum, Candida albicans, Coniothyrium olivaceum, Epicoccum nigrum, Geotrichum candidum, Gliomastix murorum, Myrothecium roridum, Thysanophora penicillioides, Scopulariopsis brevicaulis, Sporothrix fungorum, Talaromyces rugulosus, Trichocladium polysporum, Trichophyton terrestre, Ulocladium chartarum* etc. total 37 species).

Table 2 Characteristic of mycobiota of investigated biotopes according to the response reaction to the pollution

Biotopes	The number of species belonging to the groups			
	I	II	III	IV
Contaminated with production products	4	13	17	5
İrrigation	4	18	21	4
Oil and oil products	0	5	14	7
Soils contaminated by the impact of motor transport	1	11	16	6
Urban soils	2	15	15	5
Areas used for the disposal of garbage	3	17	18	4
Relatively clean soils	8	24	19	0

According to the above-mentioned system identification of species of fungi spread on soils affected to the anthropogenic impact are also allowing to defined those which characterized as an indicator during the ecological assessment of those soils. Thus, according to the results of 6-7 years of monitoring was determined that the degree of contamination of gray-brown soils in Absheron with industrial toxicants is one a factor that causes to spread a certain group of fungi. For example, isolating fungi from soil belonging to the first group indicates that those soils are not severely exposed to the effects of ecotoxicants. Determining the spread of fungi belonging to groups of 2 and 3 in the soil indicates that the background level of the amount of ecotoxicants entering the soil is increased several times over. The spread of fungi belonging to the 3rd, especially the 4th group, should be accepted as an indication of the more increase of background levels of ecotoxicants in soils. In this regard, the Absheron Peninsula may be considered dangerous in terms of pollution by oil and oil products.

Thus, as a result of the researches is possible to say that components of these identified reactions consists from separate micromycetes which their identification by the level of species for use as indicator for the assessment of soils affected to the anthropogenic impact, as well as prepared preventive measures for the prevention of unpleasant situations occurring in this or that biotope may be useful as base data.

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