

COMMUNICATIONS

Biology

POISONING FUNGI AND POISONINGS WITH MACROMYCETES

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As a result of our research in Armenia were established 59 species of poisonous macromycetes, which belong to 16 genera, 10 families and 5 orders. The largest numbers of poisonous species are found in North-Eastern regions of the Republic. According to the data of the Ministry of Healthcare of RA, in 2014–2016 on the entire territory of the Republic were registered 147 poisoning cases with fungi.

Keywords: poisoning, fungi, health, toxins.

Introduction. Macrofungi play a great role in natural systems and in agriculture. Fungi have an activity in energetic processes occurring in ecosystems and are widely used in many branches of the economy.

At the same time, a dangerous role in human life plays poisonous fungi that contain various toxins, which lead to poisoning and even death. Nowadays, about 60 species of poisonous macromycetes have been identified in Armenia, which belong to genera *Inocybe*, *Clitocybe*, *Tricholoma*, *Entoloma*, *Paxillus*, *Hypholoma*, *Amanita*, etc. [1–3]. Poisonings by macromycetes are associated not only with the presence of toxins in them, but also if the fungi are exposed to bacterial, fungal or chemical contamination, which leads to their infection by bacteria or pathogenic fungi. In the first case the fungi are exposed to mechanical damage or penetration of insects into damaged parts. The second case is related to the ability of many macroscopic fungi species to accumulate and absorb heavy metals, pesticides, fungicides, which are toxic to humans [1, 4].

Materials and Methods. For the current work we used macroscopic fungi from some regions of Armenia. Also, material was taken from the herbarium of the Department of Botany and Mycology of YSU, as well as from the available literature sources.

The route-expedition method was used in order to study the species composition of fungi from investigated territories. Collection, processing and storage of fruit bodies of macromycetes, were carried out according to the generally accepted methods of mycological research [5]. In order to identify the species, in addition we used macro- and micromorphological and chemical methods [5, 6].

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To determine the species belonging to poisonous macroscopic fungi, determinants, monographs and internet sites were used for specific taxonomic groups [7, 8].

During this work distribution of poisonous macromycetes by taxonomic and floristic regions was done. Moreover, the data of poisoning cases with fungi have been developed during the last 3 years by the Ministry of Healthcare.

Results and Discussions. Depending on the nature of poisoning, toxins of the poisonous fungi are divided into three groups. Toxins that cause digestive disorders belong to the I group of toxins. These toxins are presented in the genera of *Russula*, *Agaricus*, *Tricholoma*, etc. The II group of toxins are presented in some fungi from the genera *Amanita*, *Cortinarius*, *Entoloma*, *Hebeloma*, etc. and leads to disorders of the central nervous system. Toxins in these poisonous mushrooms are mainly muscarin, muscaridine, psilocin, psilocybin, which also have a hallucinogenic effect. The most dangerous group of toxins are presented the III group, which mainly causes death. Poisoning occurs due to the use in food the Deathcap (*Amanita phalloides* (Fr.) Link), *Amanita virosa* (*Amanita virosa* Bertill.) and others. Poisonings occur mainly in the summer-autumn period, when the collection and consumption of fungi have increased.

As a result of our research 59 species of poisonous macromycetes were established. The studied species belong to 16 genera, 10 families and 5 orders. By the species diversity *Inocybe* genus, which belongs to *Cortinariaceae* family, includes 17 species and it takes the first place. In the second place are *Clitocybe*, *Amanita* and *Tricholoma* genera (6 species). The rest of genera are relatively small in number (from 1 to 4 species).

Cases of poisonings with macromycetes in Armenia (2014–2016)

Year	Region	Female	Male	Child	The total number of poisonings
2014	Ararat	–	2	3	34
	Lori	12	10	2	
	Kotayk	4	–	–	
	Tavush	–	–	1	
2015	Ararat	2	3	5	69
	Aragatsotn	4	1	7	
	Armavir	8	6	2	
	Lori	12	9	3	
2016	Kotayk	1	2	4	44
	Ararat	3	2	2	
	Armavir	2	1	2	
	Aragatsotn	–	–	1	
	Gegharkunik	–	1	3	
Yerevan	1	1	1	44	
Lori	9	10	5		
Total 2014–2016		58	48	41	147

The studied species are found everywhere in the country, but their floristic composition is not homogeneous across the regions. Our research showed that identified species of poisonous fungi in majority are in the North-Eastern regions, where climatic conditions are favorable for their growth. All poisonous fungi that are found are included in the following categories: extremely poisonous fungi

(*Amanita phalloides* (Fr.) Link, *Entoloma sinuatum* (Bull.) P. Kumm., *Hypholoma fasciculare* (Huds.) P. Kumm., ect.); poisonous fungi (*Boletus satanas* Lenz, *Entoloma vernum* S. Lundell, *Tricholoma sulphureum* (Bull.) P. Kumm., ect.); light poisoning generating fungi (*Agaricus xanthodermus* Genev., *Russula emetica* (Schaeff.) Pers., *Lactarius zonarius* (Bull.) Fr, *Marasmius rotula* (Scop.) Fr., ect.).

According to the data of the Ministry of Healthcare of the Republic of Armenia, in 2014–2016 the entire territory of Armenia has registered 147 poisoning cases with fungi (see Table).

The most cases of poisoning were observed in the Lori region. In recent years poisonings by edible fungi were recorded multiple times in this region. Investigations showed that in Lori during the collection of fungi chemical treatment of forests were done, which caused light poisonings.

Thus, we note that only by increasing the population knowledge about fungi it is possible to reduce the amount of fungal poisonings. It is necessary to carry out various explanatory actions among the population, especially in the regions of the country, and licensing of mushroom pickers and mandatory inspections of the quality of mushroom products placed on the shelves of markets.

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