

COMMUNICATIONS

*Biology*

DATABASE OF MYCORRHIZAL FUNGI  
OF THE REPUBLIC OF ARMENIA

A. S. STEPANYAN, L. V. MARGARYAN, S. G. NANAGULYAN \*

*Chair of Botany and Mycology YSU, Armenia*

The computerized database of mycorrhizal fungi, which includes detailed information about 211 mycorrhizal species of the RA was created. The database allows for use this information for scientific and practical purposes

**Keywords:** mycorrhizal fungi, the database, information field.

**Introduction.** Mycorrhizal fungi are one of the important ecological groups of macromycetes. Mycorrhiza is a symbiosis with tree roots. The mycelium of mycorrhizal fungi is in shell form, composed of interwoven hyphae system, is covering the plants with small roots and root hairs increasing the surface area and water supply several times. Mycorrhizal fungi have high resistance to stressful conditions. The mycorrhiza of trees, which is broadly common in nature, is the basis for the survival of forests and their study and conservation have a great practical importance. In many countries, mycorrhizal fungi are successfully used for growing seedlings and plantations, which are widely used for landscaping cities polluted with industrial wastes [1].

Mycorrhizal fungi are obligate. Some macromycetes and plants can be grown independently in the greenhouse or laboratory, in nature most species require the symbiosis. For this reason, mycorrhizal fungi have been introduced to novel ranges when plants are managed for commercial purposes. For example, in the southern hemisphere, pine forests did not grow until soils with mycorrhizal fungi were imported and mixed with the native soils around planted pine seedlings. Although specificity is a feature of some associations, and, for example, the fungal genus *Suillus* is specific to the plant genus *Pinus*, other mycorrhizal fungi are generalists, and these species may jump to new hosts in novel habitats [2].


In this respect, we started to create computerized database of mycorrhizal fungi of Armenia, which is very important for practical purposes and future scientific investigations.

**Materials and Methods.** For creating the database of mycorrhizal fungi of the Republic of Armenia both personally collected fungi and the collections of fungi preserved in the Department of Botany and Mycology (ERHM), also literature data were used as materials. The database was prepared in Access 2007, OS Windows domain. It includes the following information: the classification of fungi (class, order, family,

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\* E-mail: [snanagulyan@ysu.am](mailto:snanagulyan@ysu.am)

genus), species name in Latin and Armenian, name of the author, the most important synonyms, substrate, phytocenosis, floristic regions, ecological group, height of location (m. above sea level), collection month, brief description of species morphology, nutritional value, meeting frequency, picture and links (see Figure).

Class	Hymenobasidiomycetes	Species Latin	<i>Boletus satanas</i> Lenz	Substrate	On the ground	Height of location	600-1500m
Order	Boletales	Species Arm.	Սատանայանիկ	Phytocenosis	Broadleaf forests		
Family	Boletaceae			Floristic region	Ijevan, Zangezur	Month	September
Genus	<i>Boletus</i> Fr.	Synonym	<i>Tubiporus satanas</i> (Lenz) Maire, <i>Publicacions del Instituto Botánico</i>	Ecological group	Mycorrhizal fungi		
Description	<i>Boletus satanas</i>						
Cap	The diameter of cap is 8-25cm, hemispheric, smooth or velvet, dry, greyish white, when older it tends more to a greenish ochre or leather colour. Flesh is white when cut at first turn red, then blue.			Picture			
Gills / tubes	Tubes are up to 3 mm long. At first they are pale yellow or greenish yellow before soon reddening and are already entirely purplish red or carmine before full maturity.						
Stipe	The height of stipe is 5-15 cm, thickness 3-10 cm, at first oval, then spheric.			Links			
Spores	The spores are 11-15x4-7 mikm, elliptic, yellow, smooth. The spore powder is brown, olive green.			1 Nanagulyan S.G. Cap Fungi of Armenia (Agaricoid Basidiomycetes). Yerevan, YSU Press, 2008 - 121 p. 2 <a href="http://www.mycobank.org/BioID/MICS.aspx?TableK">http://www.mycobank.org/BioID/MICS.aspx?TableK</a>			
Nutritional value	Poisonous			Meeting frequency			
				Rare, includes in Red Book of Armenia, 2010			

Sample of Electronic Database

**Results and Discussions.** One method of making the information available is the creation and maintenance of digital or virtual collections by digital technology. Therefore, we decided to create the computer database of mycorrhizal fungi of the RA.

Table 1

The leader genera according to the number of species

№	Leading geniuses	Species number	№	Leading geniuses	Species number
1	<i>Cortinarius</i>	33	17	<i>Gomphidius</i>	2
2	<i>Russula</i>	32	18	<i>Craterellus</i>	2
3	<i>Lactarius</i>	31	19	<i>Sarcodon</i>	2
4	<i>Tricholoma</i>	21	20	<i>Leccinum</i>	2
5	<i>Hygrophorus</i>	12	21	<i>Thelephora</i>	2
6	<i>Amanita</i>	11	22	<i>Albatrellus</i>	1
7	<i>Boletus</i>	7	23	<i>Boletopsis</i>	1
8	<i>Entoloma</i>	7	24	<i>Chroogomphus</i>	1
9	<i>Hebeloma</i>	7	25	<i>Hydnum</i>	1
10	<i>Inocybe</i>	6	26	<i>Laccaria</i>	1
11	<i>Suillus</i>	6	27	<i>Paxillus</i>	1
12	<i>Xerocomus</i>	5	28	<i>Rhizopogon</i>	1
13	<i>Amanitopsis</i>	4	29	<i>Rozites</i>	1
14	<i>Ramaria</i>	4	30	<i>Scleroderma</i>	1
15	<i>Cantharellus</i>	2	31	<i>Strobilomyces</i>	1
16	<i>Chalciporus</i>	2	32	<i>Tuber</i>	1

The database of micorrhizal fungi includes 211 species of macromycetes, which belong to 32 genera and they are included into 20 families.

The analysis of the symbiotrophic fungi database has shown, that of the presented families leaders are *Boletaceae* and *Cortinariaceae* with 4 genera and *Russulaceae*, *Tricholomataceae*, *Amanitaceae*, *Gomphidaceae*, *Thelephoraceae* with 2 genera.

The largest genera from presented 211 species of mycorrhizal fungi are: *Cortinarius* (33), *Russula* (32), *Lactarius* (31), *Tricholoma* (21), *Hygrophorus* (12),

*Amanita* (11), *Boletus* and *Entoloma* (with 7 species), *Inocybe* and *Suillus* (with 6 species) (Tab. 1). The other genera are presented with fewer species (1–5).

The mycorrhizal fungi of the database counted the 17% of the republic's 1220 species of macromycetes) [3].

Database indicates the distribution of species according to the floristic regions separated by Takhtajan [4]. The results of this research and available literature data have shown that in various floristic regions of Armenia different number of mycorrhizal fungi species are common. According to data, most of symbiotrophic fungi are found in northeast and southern Armenia: in Ijevan (172 species) and Zangezur (94 species) floristic regions, where basically the forests are concentrated. These regions of the Republic are famous for mild climate and trees with high mycotrophic degrees [5–7]. Then, in the second place of floristic regions are Lori (88 species), Aparan (83) and Sevan (21). The other floristic regions contain from 2 to 12 species of mycorrhizal macromycetes (Tab. 2).

Table 2

The number of species according to floristic regions of Armenia

№	Floristic region	Species number
1	Ijevan	172
2	Zangezur	94
3	Lori	88
4	Aparan	83
5	Sevan	21
6	Yerevan	12
7	Dalaragyaz	5
8	Geghama	3
9	Meghri	3
10	Verin Akhuryan	2
11	Shirak	2
12	Aragac	2

It should be noted, that in database 10 out of 211 species presented are registered in “Red Book of Armenia. Plants and Mushrooms” [8]. Those species are: *Amanita gemmata*, *Amanita muscaria*, *A. phalloides*, *Boletus edulis*, *B. satanas*, *Boletopsis leucomelaena*, *Strobilomyces floccopus*, *Suillus grevillei*, *S. punctipes*, *Tuber aestivum*.

Hereby, creating the database is actual and has a great practical use. It can be used as a specific bank for introduction, reintroduction and for other scientific and industrial also educational works.

Creating such database allows to make information available to specialists and researchers. The data can be useful for choosing fungal species, which can be used for artificial mycorrhizing of seedlings and plantations. It will be a base in agriculture and forest recovering works.

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