Studia bot. hung. 29, pp. 17–34, 1998 (1999)

GENETIC RESOURCE COLLECTION OF MACROFUNGI IN HUNGARY

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At the present time the most suitable method for long-term preservation of fungus cultures is the storage in liquid nitrogen at –196 °C. The maintenance of fungus cultures by cryogenic freezing technique eliminates the risk of traditional methods and prevents genetic damage of the material preserved in living state. The authors report about the establishing of the culture collections of macrofungi at the Department of Botany of the Hungarian Natural History Museum. These culture collections serve as depository for several species of floristical and economical importance (163 taxa, 315 isolates).

Key words: cryopreservation, genetic resource collection, Hungary, liquid nitrogen, macrofungi

INTRODUCTION

Biodiversity crisis is a well-known worldwide phenomenon, thus the maintenance of biodiversity, preserving the genetic resources of living organisms became highly important also in Hungary.

The increasing environmental pollution (air and water pollution, chemicals, etc.) influences also the environment of macrofungi, decreasing their chances of survival. In addition to the environmental damages, the excessive gathering of young fruiting bodies of some edible mushrooms of commercial importance (*e.g. Boletus edulis*, *B. aestivalis*, *Cantharellus cibarius*, *Amanita caesarea*) might reduce considerably the number of individuals. Opinions of mycologists vary in this respect (RIMÓCZI 1997).

One of the traditional practices to prevent extinction of species is to compile red lists of the rare and endangered species and to designate those for official protection. Several proposals on the macrofungi of Hungary were published recently (SILLER and VASAS 1993, 1995, RIMÓCZI 1997), thus a number of macrofungi are expected to be registered in the next Hungarian Red Data Book.

In addition to the traditional nature conservational methods, another, necessary way to preserve the individual fungus species under laboratory conditions as cultures. A relatively unexpensive, long-term and safe (damage-free) maintenance method of pure mycelium cultures is possible by a recently used method, called cryopreservation (see below).

The (biodiversity) conservational purpose genetic resource collections are very important also for the basic and applied research. From the isolates of type strains the given fungus species is reproducable at any time. These can be very important if genetic damages or mutations happened in a cultivated strain. In these cases the cryopreserved strains of the original gene pool are crucial. Genetically similar strains can be crossed and selected. The new hybrid or selected species or strains can be introduced into cultivation. The genetic resource collections can also supply several saprophytic strains containing anticarcinogenic, colesterine level reducing or antiviral substances useful for medical treatments.

The number and size of the genetic resource collections became more extensive throughout the world in the last years (LOCSMÁNDI 1992). In Hungary there is only one cryopreserved genetic resource collection of macrofungi in the Macrofungi Collection of the Hungarian Natural History Museum, in Budapest, where in addition to the 191 isolates of cultivated or potencially cultivable mushrooms, 142 strains of rare, endangered or characteristic Hungarian species are found (VASAS *et al.* 1998) (Table 1).

The technical development of cryopreservation and the foundation of the genetic resource collection storing in liquid nitrogen started here in 1991 with the financial support of the Hungarian Scientific Research Fund (OTKA No. 3187). The maintenance and the gradual enlargement of the collection since then have been further sponsored by the Hungarian Scientific Research Fund (OTKA No. 17767).

TRADITIONAL MAINTENANCE OF MYCELIUM CULTURES

The traditional method, the maintenance of isolates by periodic transfers on solid medium at room temperature, has several disadvantages. The cultures must be transferred quite frequently, 3–6 monthly after the substrate colonization, because of the senescence of the mycelium and the drying up of the medium. At lower storing temperature (2–5 °C) this time period can be extended up to 6–12 months. The cultures might be infected by microorganisms (bacteria, moulds etc.) during the isolation, incubation or storing. Morphological properties of the mycelium might change after a longer period, the growth rate, the yield rate, and the yielding capacity might decrease considerably. Also, transfers of the isolates take up much work.

The traditional culture collection in the Hungarian Natural History Museum was founded by Gábor Bohus in the 1950s. The first pure cultures were prepared from various *Agaricus bisporus* strains. Involving these strains in cultivation, the Hungarian yielding rates increased considerably. Other strains of xylophagous species were very useful in testing fungicidal substances in case of wood de-

caying fungi in buildings. These pure cultures were also used for testing antipathogenic and anticarcinogenic effects of the fungicides produced by the macrofungi. Enzyme production rates were also studied in these traditional pure culture collections.

The continuously increasing number of the isolates made it necessary to use the more feasible storing technique in liquid nitrogen, instead of the periodic transfer method. This technique allows a gradual enlargement of the collection and ensures a good prevention against infections and other risk factors.

CRYOPRESERVATION OF MACROFUNGI IN LIQUID NITROGEN

For pure cultures a small piece of the broken fruiting body of a well identified fungus specimen is isolated by a sterile scalpel from the contact zone of the cap and the stalk. The isolates are placed on agar slants. The fruiting bodies should not to be too old, because isolates from young fruiting bodies show better viability. If the fruiting bodies are wet, the probability of infections will increase significantly. Several isolates can be taken from the same fruiting body collection. However, they should be transferred only, if their morphological properties and growth parameters are similar.

After substrate colonization the cultures are transferred to Petri plates. At the required size of the mycelium web agar disks of 8 mm diameter are cut by sterile cork-borer. Then the disks are placed into polypropylen cryotubes (2 ml) and closed by screw cap. The plastic cryotubes, in contrast with the glass tubes, are very advantageous to the vitality of the cultures (SIMIONE *et al.* 1977), and they are not fragile. However, it might be disadvantageous, that after repeated use they do not fit close, becoming permeable for the nitrogen in the liquid phase. Three disks are placed in each tubes, and then a cryoprotective substance, 1.5 ml 10% glycerine is added. Five tubes should be prepared in this way from each isolates.

The next step of the procedure is the pre-freezing. Its crucial point is to find the most suitable timing of cooling and re-heating, *i.e.* the best cooling speed. Instead of using very expensive freezers equipped by built-in computer, a cheaper and more simple method was elaborated in our department. There is a temperature gradient in the nitrogen vapour above the liquid nitrogen surface. Placing the material to be frozen at different heights above the surface of the liquid nitrogen a freezing curve (Fig. 1) can be prepared. Usually *ca.* 1 °C/min temperature decrease is the most optimal for the cultures. After the cultures have been cooled down to –40 °C (this takes about 1 hour), they can be sunken in the liquid nitrogen.

After the pre-freezing procedure the cryotubes are fastened onto holders. The holders are placed in canisters, which have a handle and sieve-like bottom. The canisters are sunken into liquid nitrogen in a culture-storing container (40 l, GT–40 type). A total of 1,200 tubes (2 ml) can be stored in one GT–40 type container (10 canisters, 20 holders per canister, and 6 tubes per holder).

Each tube is furnished with a 5-digit-number code. The first two digits stand for the number of the canisters (01–10), the second two digits for the number of the holders (01–20), and the last digit for the position of the tube on the holder (1–6), numbering from downwards to upwards in increasing order. These code numbers are written by alcohol-based (permanent) marker pen. In our experience, this ink is not damaged by the low temperature.

The isolates can be stored in liquid nitrogen at ultralow temperature (–196°C) for decades without any damage. It is very important to revive the cultures in every 2–3 years for testing their vitality, virulence, purity and morphological properties. Two tubes per isolates are recommended to be tested. They are warmed up at 35–40°C for some minutes, until the last ice crystals have been melted. The outer surface of the tubes have to be cleaned very carefully by alcohol, and then the agar disks are placed in Petri plates. If the mycelium web falls off the surface of the agar disk by chance, the whole glycerine solution (incl. the mycelium web and fragments) should be poured onto the medium, after having removed the agar disks.

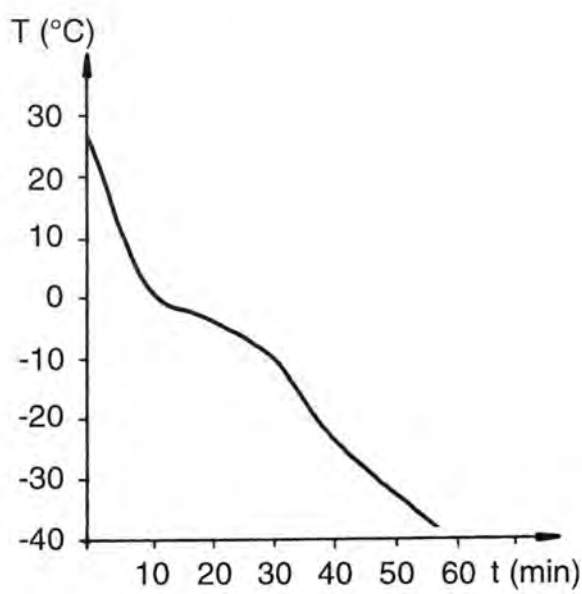


Fig. 1. Freezing curve.

Then the Petri plates are incubated at 25°C and 90% relative humidity. Mycelia – depending on the species – begin to grow after 1–14 days. Diameters of the cultures are measured daily until they reach *ca.* 70 mm. The freezing procedure is accepted, if the revived fungus has not been infected, more than 50% of the disks have begun to grow and their morphological properties were similar. Growth rate and yielding capacity of the revived cultures were studied by several authors (HWANG 1968, KNEEBOONE *et al.* 1974), and no significant difference was found in any studied parameters compared with the control samples.

Table 1. Data of the cryopreserved 315 isolates in the genetic resource collection of the macrofungi of Hungary. (Exact collecting and/or freezing data are not available in case of some early isolates (1940–1960)).

Code	Species	Collecting data	Date of freeze
09044	*Agaricus arvensis* Schaeff. ex Fr. var. *cretaceus* Fr.	08.05.1974. Ohat	28.04.1992.
09133	*Agaricus augustus* Fr.	01.08.1955. near the Danube	30.07.1992.
09053	*Agaricus bernardii* (Quél.) Sacc.	1960. Balmazújváros	18.06.1992.
09023	*Agaricus bernardiiformis* Bohus	16.04.1974. Hortobágy	22.04.1992.
09043	*Agaricus bernardiiformis* Bohus	07.04.1992. Hortobágy	28.04.1992.
09141	*Agaricus bernardiiformis* Bohus	08.05.1990. Szolnok	18.09.1992.
09021	*Agaricus bisporus* (Lge.) Sing.	28.10.1964. Mende	22.04.1992.
09036	*Agaricus bisporus* (Lge.) Sing.	09.1968.	23.04.1992.
09041	*Agaricus bisporus* (Lge.) Sing.	02.10.1968. Hortobágy	28.04.1992.
09042	*Agaricus bisporus* (Lge.) Sing.	29.05.1969.	28.04.1992.
09054	*Agaricus bisporus* (Lge.) Sing.	13.04.1992. Máriakálnok	18.06.1992.
09132	*Agaricus bisporus* (Lge.) Sing.	10.11.1957. Pomáz	30.07.1992.
10091	*Agaricus bisporus* (Lge.) Sing.	30.05.1974. Békéscsaba	18.02.1992.
10092	*Agaricus bisporus* (Lge.) Sing.	26.06.1977. Szigetmonostor, Horány	18.02.1992.
10093	*Agaricus bisporus* (Lge.) Sing.	18.09.1975. Visegrád Mts, Lajos-forrás	18.02.1992.
10096	*Agaricus bisporus* (Lge.) Sing.	27.09.1972. Dabas	28.02.1992.
10104	*Agaricus bisporus* (Lge.) Sing.	20.05.1972. Hortobágy	25.02.1992.
10105	*Agaricus bisporus* (Lge.) Sing.	12.04.1975. Szigetmonostor, Horány	25.02.1992.
10106	*Agaricus bisporus* (Lge.) Sing.	13.10.1972. Hortobágy	25.02.1992.
10164	*Agaricus bisporus* (Lge.) Sing. var. *perrubescens* Bohus	06.10.1991. Pomáz	08.04.1992.
08193	*Agaricus bitorquis* (Quél.) Sacc.	26.07.1992. Sérfenyősziget	16.09.1996.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
10094	*Agaricus bitorquis* (Quél.) Sacc.	10.05.1972. Szigetmonostor, Horány	18.02.1992.
10101	*Agaricus bitorquis* (Quél.) Sacc.	1949. Pamuk	25.02.1992.
10102	*Agaricus bitorquis* (Quél.) Sacc.	24.06.1953. Budapest	25.02.1992.
10103	*Agaricus bitorquis* (Quél.) Sacc.	05.06.1959. Budapest, Városliget	25.02.1992.
10133	*Agaricus bitorquis* (Quél.) Sacc.	04.05.1951. Nadap	09.03.1992.
09114	*Agaricus bitorquis* (Quél.) Sacc. var. *nánai* Bohus	07.06.1954. Bogyiszló	27.02.1992.
10124	*Agaricus bitorquis* (Quél.) Sacc. var. *nánai* Bohus	05.10.1953. Bogyiszló	22.07.1992.
09142	*Agaricus bohusii* Bon	05.09.1991. Dömös, Dobogó-hegy	18.09.1992.
09052	*Agaricus bresadolianus* Bohus	06.10.1960. Mende	18.06.1992.
08061	*Agaricus campester* (L.) Fr.	21.09.1992. Aggtelek	23.09.1994.
09173	*Agaricus campester* (L.) Fr.	12.10.1992. Vitnyéd	15.12.1993.
10153	*Agaricus campester* (L.) Fr.	19.09.1968. Buda Mts, Tök-hegy	13.03.1992.
09051	*Agaricus fissuratus* (Moell.) Moell.	05.06.1960. Debrecen	18.06.1992.
09115	*Agaricus fissuratus* (Moell.) Moell.	09.1969. Debrecen	22.07.1992.
10152	*Agaricus gennadii* (Chat. et Boud.) Orton		13.03.1992.
08062	*Agaricus haemorrhoidarius* Kalchbr. et Schulz.	23.09.1992. Hangony	23.09.1994.
10145	*Agaricus macrocarpus* (Moell.) Moell.	10.09.1972. Kisinóc	10.03.1992.
10121	*Agaricus macrosporus* (Moell. et J. Schaeff.) Pilát	29.08.1970. Budapest	27.02.1992.
10156	*Agaricus macrosporus* (Moell. et J. Schaeff.) Pilát	22.06.1969. Buda Mts, Látó-hegy	13.03.1992.
09024	*Agaricus maskae* Pilát	08.10.1960. Debrecen	11.02.1992.
10061	*Agaricus maskae* Pilát	18.06.1959. Szekszárd	11.02.1992.
08063	*Agaricus porphyrizon* Orton	08.11.1992. Zebegény	28.09.1994.
08161	*Agaricus porphyrizon* Orton	10.11.1992. Szob	18.12.1995.
08162	*Agaricus romagnesii* Wasser	28.09.1994. from Bohus Gábor	18.12.1995.
09134	*Agaricus semotus* Fr.	1950.	30.07.1992.
08034	*Agaricus silvicola* (Vitt.) Sacc.	24.09.1992. Hangony	19.12.1993.
10016	*Agaricus silvicola* (Vitt.) Sacc.	04.10.1969. Budakeszi	30.01.1992.
09013	*Agaricus subperonatus* (Lge.) Sing.	12.11.1990. Kunadacs	16.04.1992.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
09022	*Agaricus vaporarius* (Pers. ex Vitt.) Moser	06.06.1990. Budapest	22.04.1992.
10071	*Agaricus vaporarius* (Pers. ex Vitt.) Moser	03.08.1968. Bugyi	12.02.1992.
09143	*Agaricus xanthoderma* Gen.	1949.	18.09.1992.
10011	*Agrocybe aegerita* (Brig.) Sing.	25.10.1965. Velence	30.01.1992.
10012	*Agrocybe aegerita* (Brig.) Sing.	07.11.1968. Budapest, Margitsziget	30.01.1992.
10013	*Agrocybe aegerita* (Brig.) Sing.	08.10.1969. Szentendre	30.01.1992.
08016	*Agrocybe erebia* (Fr.) Kühn.	12.10.1992. Miskolc	16.12.1993.
08076	*Agrocybe praecox* (Pers. ex Fr.) Fay.	27.06.1993. Nagycenk	26.09.1994.
08121	*Agrocybe praecox* (Pers. ex Fr.) Fay.	16.05.1995. Fertőendréd	11.12.1995.
09194	*Amanita rubescens* (Pers. ex Fr.) S. F. Gray	07.10.1995. Pilisszentkereszt	27.02.1997.
10023	*Antrodia sinuosa* (Fr.) P. Karst.	31.05.1963. from Bálint György	04.02.1992.
10166	*Antrodia sinuosa* (Fr.) P. Karst.	1955. from Holland collection	08.04.1992.
09096	*Antrodia sinuosa* (Fr.) P. Karst.	Sopron	03.09.1992.
08066	*Armillaria luteovirens* (A. et S. ex Fr.) Gill.	12.05.1993. from Albert László	28.09.1994.
08075	*Armillariella mellea* (Vahl. in Fl. Dan. ex Fr.) Karst.	01.10.1993. Bátorliget	26.09.1994.
08201	*Armillariella mellea* (Vahl. in Fl. Dan. ex Fr.) Karst.	04.10.1992. Nagycenk	23.09.1996.
10065	*Armillariella mellea* (Vahl. in Fl. Dan. ex Fr.) Karst.	1948.	11.02.1992.
08202	*Armillariella obscura* (Secr.) Romagn.	14.10.1992. Kétvölgy	23.09.1996.
08203	*Armillariella tabescens* (Scop. ex Fr.) Sing.	29.09.1992. Sopron	23.09.1996.
09034	*Armillariella tabescens* (Scop. ex Fr.) Sing.	24.10.1990. Nagybajom	23.04.1992.
08073	*Auricularia auricularia-judae* (Bull. ex St.-Anm.) Wettst.	26.10.1993. Miskolc	26.09.1994.
08101	*Auricularia auricularia-judae* (Bull. ex St.-Anm.) Wettst.	08.09.1995. Nagycenk	28.08.1996.
09146	*Calocybe gambosa* (Fr.) Donk	21.05.1992. Himod	18.09.1992.
02151	*Calvatia utriformis* (Bull. ex Pers.) Jaap	04.05.1992. Bódvaszilas	23.06.1992.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
08044	*Calvatia utriformis* (Bull. ex Pers.) Jaap	14.09.1992. Aggtelek	20.12.1993.
09104	*Calvatia utriformis* (Bull. ex Pers.) Jaap	16.06.1992. Döbrönte	20.12.1993.
10035	*Chondrostereum purpureum* (Pers. ex Fr.) Pouzar	1955. from Holland collection	05.01.1992.
08141	*Clitocybe dealbata* (Sow. ex Fr.) Kumm.	20.09.1995. Szászberek	13.12.1995.
10126	*Clitocybe gallinacea* (Scop. ex Fr.) Lge.	from Gláz Ervin	27.02.1992.
10021	*Clitocybe geotropa* (Bull. ex Fr.) Quél.	from Gláz Ervin	04.02.1992.
08023	*Clitocybe gibba* (Pers. ex Fr.) Kumm.	23.09.1992. Szin, Szelcepuszta	18.12.1993.
09153	*Clitocybe lignatilis* (Pers. ex Fr.) Karst.	04.11.1992. Bükk Mts, Őserdő	13.12.1993.
09154	*Clitopilus prunulus* (Scop. ex Fr.) Kumm.	16.10.1992. Kétvölgy	13.12.1993.
09145	*Collybia butyracea* (Bull. ex Fr.) Quél.	1948.	18.09.1992.
08022	*Collybia butyracea* (Bull. ex Fr.) Quél.	06.11.1992. Szin, Szelcepuszta	18.12.1993.
08131	*Collybia confluens* (Pers. ex Fr.) Kumm.	16.09.1994. Böhönye	12.12.1995.
08143	*Collybia dryophila* (Bull. ex Fr.) Kumm.	22.09.1992. Aggtelek, Bacsó-nyak	13.12.1995.
09032	*Collybia fusipes* (Bull. ex Fr.) Quél.	1949.	23.04.1992.
08111	*Collybia fusipes* (Bull. ex Fr.) Quél.	26.09.1994. Budapest, Akadémiai-erdő	08.12.1995.
08151	*Collybia peronata* (Bolt. ex Fr.) Sing.	12.06.1995. Pilisszentkereszt	14.12.1995.
10026	*Coniophora puteana* (Schum. ex Fr.) P. Karst.	31.05.1963. Sopron	04.02.1992.
09033	*Coniophora puteana* (Schum. ex Fr.) P. Karst.	09.1958. Russia, Himki	23.04.1992.
09046	*Coniophora puteana* (Schum. ex Fr.) P. Karst.	03.1962. Sopron	28.04.1992.
09101	*Coniophora puteana* (Schum. ex Fr.) P. Karst.	1955. from Holland collection	21.07.1992.
09072	*Coprinus atramentarius* (Bull. ex Fr.) Fr.	1953.	22.06.1992.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
08043	*Coprinus comatus* (Müll. in Fl. Dan. ex Fr.) S. F. Gray	23.09.1992. Hangony	20.12.1993.
10062	*Coprinus comatus* (Müll. in Fl. Dan. ex Fr.) S. F. Gray	1952.	11.02.1992.
10063	*Coprinus comatus* (Müll. in Fl. Dan. ex Fr.) S. F. Gray	24.05.1981. Kecskemét	11.02.1992.
10024	*Coprinus picaceus* (Bull.) Fr.	1952.	04.02.1992.
09076	*Daedalea quercina* L. ex Fr.	1951.	22.06.1992.
09075	*Daedalea quercina* L. ex Fr.	1951.	22.06.1992.
08081	*Daedalea quercina* L. ex Fr.	04.10.1995. from Jakucs Erzsébet	05.12.1995.
08096	*Daedalea quercina* L. ex Fr.	04.10.1995. from Jakucs Erzsébet	06.12.1995.
08095	*Dendropolyporus umbellatus* (Pers. ex Fr.) Jülich	11.07.1995. Mátraháza	12.06.1996.
08132	*Fistulina hepatica* Schaeff. ex Fr.	08.09.1992. Nagycenk	14.12.1993.
08133	*Fistulina hepatica* Schaeff. ex Fr.	08.09.1992. Fertőendréd	28.08.1996.
08192	*Fistulina hepatica* Schaeff. ex Fr.	17.08.1996. Vitnyéd	16.09.1996.
09166	*Fistulina hepatica* Schaeff. ex Fr.	05.10.1992. Nagycenk	28.08.1995.
10194	*Flammulina velutipes* (Curt. ex Fr.) Sing.	29.10.1992. Sopron	23.08.1996.
10014	*Flammulina velutipes* (Curt. ex Fr.) Sing.	14.11.1991. Szentendre	30.01.1992.
09151	*Flammulina velutipes* (Curt. ex Fr.) Sing. var. *lactea* Quél.	03.12.1992. Budapest	13.12.1993.
10084	*Fomes fomentarius* (L. ex Fr.) Fr.	1951.	13.02.1992.
08015	*Fomes fomentarius* (L. ex Fr.) Fr.	24.09.1992. Szin, Kopolya-völgy	16.12.1993.
08091	*Fomitopsis pinicola* (Sw. ex Fr.) P. Karst.	04.10.1995. from Jakucs Erzsébet	06.12.1995.
10186	*Ganoderma applanatum* (Pers.) Pat.	12.06.1996. Budapest, Népliget	23.08.1996.
08011	*Ganoderma lucidum* (Fr.) P. Karst.	27.02.1993. Kópháza	16.12.1993.
09014	*Ganoderma lucidum* (Fr.) P. Karst.	14.07.1991. Rostalló	16.04.1992.
09015	*Ganoderma lucidum* (Fr.) P. Karst.	27.06.1991. Nagycenk	16.04.1992.
09016	*Ganoderma lucidum* (Fr.) P. Karst.	29.06.1991. Vitnyéd	16.04.1992.
09155	*Geopetalum carbonarium* (A. et S. ex Fr.) Pat.	14.10.1992. Farkasfa, Fekete-tó	13.12.1993.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
10075	*Gloeophyllum abietinum* (Bull. ex Fr.) P. Karst.	1955. from Holland collection	12.02.1992.
10022	*Gloeophyllum sepiarium* (Wulf. ex Fr.) P. Karst.	25.10.1957. from Igmándy Zoltán	04.02.1992.
09025	*Gloeophyllum sepiarium* (Wulf. ex Fr.) P. Karst.	Russia, Himki	22.04.1992.
09091	*Gloeophyllum sepiarium* (Wulf. ex Fr.) P. Karst.	09.06.1963. Slovakia, Kosice	08.07.1992.
08113	*Gloeoporus dichrous* (Fr. ex Fr.) Bres.	04.10.1995. from Jakucs Erzsébet	08.12.1995.
10205	*Grifola frondosa* (Dicks. ex Fr.) S. F. Gray	20.02.1996. from Kovács Ferenc	26.08.1996.
08055	*Gymnopilus spectabilis* (Fr.) Sing.	04.10.1992. Nagycenk	29.09.1994.
08122	*Helvella lacunosa* Afz.	30.05.1995. Vácrátót	11.12.1995.
08046	*Hericium coralloides* (Scop. ex Fr.) S. F. Gray	05.10.1992.	20.12.1993.
09135	*Heterobasidion annosum* (Fr.) Bref.	1951.	30.07.1992.
08102	*Heterobasidion annosum* (Fr.) Bref.	04.10.1995. from Jakucs Erzsébet	07.12.1995.
08145	*Heterobasidion annosum* (Fr.) Bref.	04.10.1995. from Jakucs Erzsébet	13.12.1995.
09073	*Heterobasidion annosum* (Fr.) Bref.	1958. from Igmándy Zoltán	22.06.1992.
10074	*Hohenbuehelia atrocoerulea* (Fr.) Sing.	1951.	12.02.1992.
10095	*Hohenbuehelia geogenia* (DC. ex Fr.) Sing. Kreisel	1952.	18.02.1992.
09176	*Hygrophoropsis aurantiaca* (Wulf. ex Fr.) R. Mre.	27.09.1992. Kétvölgy	15.12.1993.
08134	*Hypholoma elaeodes* Fr.	23.10.1995. Parád	12.12.1995.
10111	*Hypholoma fasciculare* (Huds. ex Fr.) Kumm.	1949.	26.02.1992.
10115	*Hypholoma fasciculare* (Huds. ex Fr.) Kumm.	1950	26.02.1992.
10116	*Hypholoma sublateritium* (Fr.) Quél.	1952.	26.02.1992.
10142	*Hypholoma sublateritium* (Fr.) Quél.	1948.	10.03.1992.
08135	*Hypholoma sublateritium* (Fr.) Quél.	05.11.1992. Szin, Szelcepuszta	12.12.1995.
10114	*Hypholoma sublateritium* (Fr.) Quél. f. *substerile* Lge.	02.10.1965. Buda Mts, Csúcs-hegy	26.02.1992.
10144	*Inocybe fastigiata* (Schaeff. ex Fr.) Quél.	1949.	10.03.1992.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
08123	*Inonotus radiatus* (Sow. exFr.) P. Karst.	04.10.1995. from Jakucs Erzsébet	11.12.1995.
08114	*Kuehneromyces mutabilis* (Schaeff. ex Fr.) Sing. et Smith	04.10.1995. from Jakucs Erzsébet	28.08.1996.
08206	*Kuehneromyces mutabilis* (Schaeff. ex Fr.) Sing. et Smith	19.07.1992. Nagyvárad	23.09.1996.
09102	*Kuehneromyces mutabilis* (Schaeff. ex Fr.) Sing. et Smith	18.06.1992. Buda Mts, Csúcs-hegy	21.07.1992.
09163	*Kuehneromyces mutabilis* (Schaeff. ex Fr.) Sing. et Smith	23.09.1992. Aggtelek	14.12.1993.
10125	*Kuehneromyces mutabilis* (Schaeff. ex Fr.) Sing. et Smith	1952.	27.02.1992.
10191	*Kuehneromyces mutabilis* (Schaeff. ex Fr.) Sing. et Smith	26.09.1992. Apátistvánfalva	23.08.1996.
10192	*Kuehneromyces mutabilis* (Schaeff. ex Fr.) Sing. et Smith	26.10.1992. Sopron, Hidegvíz-völgy	23.08.1996.
10193	*Kuehneromyces mutabilis* (Schaeff. ex Fr.) Sing. et Smith	29.09.1992. Kemestaródfa	23.08.1996.
10201	*Kuehneromyces mutabilis* (Schaeff. ex Fr.) Sing. et Smith	26.09.1992. Kétvölgy	26.08.1996.
10202	*Kuehneromyces mutabilis* (Schaeff. ex Fr.) Sing. et Smith	18.10.1992. Buda Mts, Csúcs-hegy	26.08.1996.
10203	*Kuehneromyces mutabilis* (Schaeff. ex Fr.) Sing. et Smith	29.09.1992. Felsőszölnök	26.08.1996.
10204	*Kuehneromyces mutabilis* (Schaeff. ex Fr.) Sing. et Smith	30.07.1992. Kemence	26.08.1996.
08191	*Laetiporus sulphureus* (Bull. ex Fr.) Murrill	13.05.1996. from Buczkó Krisztina	16.09.1996.
08163	*Langermannia gigantea* (Batsch ex Pers) Rostk.	08.09.1995. Fertőendréd	28.08.1996.
08204	*Langermannia gigantea* (Batsch ex Pers) Rostk.	21.08.1995. Marcaltő, Ihász	23.09.1996.
09092	*Lentinula edodes* (Berk.) Pegler	1972. Vietnam, from Pham Van Ut	08.07.1992.
10113	*Lentinula edodes* (Berk.) Pegler	1954. China	26.02.1992.
10134	*Lentinula edodes* (Berk.) Pegler	17.06.1967. from Véssey	09.03.1992.
10135	*Lentinula edodes* (Berk.) Pegler	03.02.1975. from Véssey	09.03.1992.
07203	*Lentinula edodes* (Berk.) Pegler	06.01.1997. from Szili István	29.07.1997.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
07201	*Lentinula edodes* (Berk.) Pegler	06.01.1997. from Szili István	29.07.1997.
07202	*Lentinula edodes* (Berk.) Pegler	06.01.1997. from Szili István	29.07.1997.
09103	*Lentinus cyathiformis* (Schaeff. ex Fr.) Bres.	26.05.1992. Sérfenyősziget	21.07.1992.
10136	*Lentinus cyathiformis* (Schaeff. ex Fr.) Bres.	1952. Alsógöd	09.03.1992.
10122	*Lentinus cyathiformis* (Schaeff. ex Fr.) Bres.	12.06.1984. Szigetmonostor, Horány	27.02.1992.
09035	*Lenzites betulina* (L. ex Fr.) Fr.	from Igmándy Zoltán's collection	23.04.1992.
10123	*Lepista irinoides* Bohus	Uzsa	27.02.1992.
08152	*Lepista luscina* (Fr.) Sing.	10.10.1992. Vitnyéd	14.12.1995.
08025	*Lepista nebularis* (Fr.) Harmaja	07.11.1992. Szin, Szelcepuszta	18.12.1993.
08153	*Lepista nuda* (Bull. ex Fr.) Cooke	17.10.1992. Sérfenyősziget	28.08.1996.
08205	*Lepista nuda* (Bull. ex Fr.) Cooke	06.11.1992. Szin, Szelcepuszta	23.09.1996.
08154	*Lepista sordida* (Fr.) Sing.	22.09.1992. Szádvár	22.08.1996.
10143	*Leucocoprinus bresadolae* Schulz.	21.09.1966. Isaszeg, Szentgyörgy-puszta	10.03.1992.
03081	*Leucopaxillus lepistoides* Schulz.	23.05.1954. Szeged	09.03.1992.
09045	*Leucopaxillus lepistoides* Schulz.	22.06.1959. Buda Mts, János-hegy	28.04.1992.
08155	*Lycoperdon pyriforme* Schaeff. ex Pers.	17.09.1995. Bükk Mts, Csanyik	14.12.1995.
08164	*Lycoperdon pyriforme* Schaeff. ex Pers.	22.09.1992. Szin, Szelcepuszta	18.12.1995.
09203	*Lyophyllum decastes* (Fr.) Sing.	14.10.1992. Farkasfa	27.08.1996.
09204	*Lyophyllum decastes* (Fr.) Sing.	09.10.1992. Budapest, Népliget	27.08.1996.
09206	*Lyophyllum decastes* (Fr.) Sing.	10.10.1992. Miskolc	16.09.1996.
10163	*Lyophyllum decastes* (Fr.) Sing.	17.09.1991. Kétvölgy	08.04.1992.
08092	*Lyophyllum fumosum* (Pers. ex Fr.) Kühn. et Romagn. ex Orton	29.09.1994. from Értekes Lajos	06.12.1995.
09031	*Lyophyllum fumosum* (Pers. ex Fr.) Kühn. et Romagn. ex Orton	22.09.1990. Sérfenyősziget	23.04.1992.
08194	*Lyophyllum fumosum* (Pers. ex Fr.) Kühn. et Romagn. ex Orton	11.10.1992. Miskolc.	27.08.1996.
09205	*Lyophyllum fumosum* (Pers. ex Fr.) Kühn. et Romagn. ex Orton	14.10.1992. Farkasfa	27.08.1996.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
10161	*Lyophyllum fumosum* (Pers. ex Fr.) Kühn. et Romagn. ex Orton	1952. Budapest, Állatkert	08.04.1992.
10162	*Lyophyllum fumosum* (Pers. ex Fr.) Kühn. et Romagn. ex Orton	19.10.1990. Fertőendréd	08.04.1992.
08026	*Macrolepiota excoriata* (Schaeff. ex Fr.) Moser	07.09.1992. Aggtelek	18.12.1993.
10171	*Macrolepiota excoriata* (Schaeff. ex Fr.) Moser	17.09.1991. Kétvölgy	10.04.1992.
08124	*Macrolepiota procera* (Scop. ex Fr.) Sing.	24.09.1992. Bódvaszilas	28.08.1996.
10172	*Macrolepiota rhacodes* (Vitt.) Sing.	17.09.1991. Kétvölgy	10.04.1992.
09202	*Marasmius oreades* (Bolt. ex Fr.) Fr.	10.10.1992. Vitnyéd	27.08.1996.
10044	*Mitrophora semilibera* (DC. ex Fr.) Leveille	25.04.1971. Budapest, Szépvölgy	06.02.1992.
10045	*Mitrophora semilibera* (DC. ex Fr.) Leveille	1951.	06.02.1992.
10041	*Morchella conica* Pers.	1951. Vácrátót	06.02.1992.
10042	*Morchella conica* Pers.	17.04.1991. Fót	06.02.1992.
10043	*Morchella conica* Pers.	14.04.1991. Fót	06.02.1992.
10195	*Morchella conica* Pers.	20.04.1996. Fót	23.08.1996.
10046	*Morchella esculenta* (L.) Pers.	25.04.1970. Buda Mts, Csúcs-hegy	06.02.1992.
10173	*Morchella esculenta* (L.) Pers.	22.04.1975. Szigetmonostor, Horány	10.04.1992.
10196	*Morchella esculenta* (L.) Pers.	20.05.1996. Pilisszentkereszt	23.08.1996.
09055	*Morchella steppicola* Zer.	15.04.1992. Fót	18.06.1992.
09063	*Mycena polygramma* (Bull. ex Fr.) S. F. Gray		19.06.1992.
09156	*Mycena renati* Quél.	05.11.1992. Aggtelek, Patkós-völgy	13.12.1993.
08156	*Mycenastrum corium* (Guersent ex DC.) Desvaux	31.05.1994. Kecskemét	14.12.1995.
10053	*Omphalotus olearius* (DC. ex Fr.) Sing.	1949.	10.02.1992.
09174	*Omphalotus olearius* (DC. ex Fr.) Sing.	09.09.1992.	15.12.1993.
09084	*Oudemansiella mucida* (Schrad. ex Fr.) v. Hoehn.	1948.	23.06.1992.
08165	*Oudemansiella mucida* (Schrad. ex Fr.) v. Hoehn.	04.10.1995. from Jakucs Erzsébet	18.12.1995.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
08032	*Oudemansiella platyphylla* (Pers. ex Fr.) Moser	09.09.1992.	19.12.1993.
10151	*Oudemansiella radicata* (Relhan ex Fr.) Sing.	1951.	13.03.1992.
08031	*Oudemansiella radicata* (Relhan ex Fr.) Sing.	23.09.1992. Aggtelek	19.12.1993.
08052	*Oudemansiella radicata* (Relhan ex Fr.) Sing.	09.09.1992.	29.09.1994.
08115	*Oudemansiella radicata* (Relhan ex Fr.) Sing.	22.09.1992. Aggtelek	08.12.1995.
09116	*Panaeolus cyanescens* Berk. et Br.	1972. Budapest, Városliget	22.07.1992.
09152	*Panellus serotinus* (Pers. ex Fr.) Kühn.	08.11.1992. Regéc, Várvölgy	13.12.1993.
09201	*Panus conchatus* (Bull. ex Fr.) Fr.	04.06.1996. Nagycenk	27.08.1996.
08053	*Panus rudis* Fr.	16.10.1992. Kétvölgy	29.09.1994.
08083	*Panus rudis* Fr.	16.05.1995. Fertőendréd	05.12.1995.
08084	*Panus tigrinus* (Bull. ex Fr.) Sing.	22.08.1995. Marcaltő, Ihász	28.08.1996.
09093	*Panus tigrinus* (Bull. ex Fr.) Sing.	08.05.1992. Petőháza	08.07.1992.
08094	*Phellinus tuberculosus* (Baumg.) Niemela	04.10.1995. from Jakucs Erzsébet	06.12.1995.
09162	*Pholiota aurivella* (Batsch ex Fr.) Kumm.	12.10.1992. Miskolc	14.12.1993.
10141	*Pholiota destruens* (Brond.) Quél.	09.1962. Budapest, Városliget	10.03.1992.
10155	*Pholiota destruens* (Brond.) Quél.	1948	13.03.1992.
08042	*Pholiota destruens* (Brond.) Quél.	12.10.1992. Fertőendréd	20.12.1993.
08136	*Pholiota destruens* (Brond.) Quél.	10.10.1992. Fertőendréd	12.12.1995.
09085	*Pholiota lenta* (Pers. ex Fr.) Sing.	1949.	23.06.1992.
10073	*Pholiota squarrosa* (Pers. ex Fr.) Kumm.	1949.	12.02.1992.
08051	*Pholiota squarrosa* (Pers. ex Fr.) Kumm.	12.10.1992. Miskolc	29.09.1994.
08085	*Pholiota squarrosa* (Pers. ex Fr.) Kumm.	03.10.1992. Sérfenyősziget	05.12.1995.
09164	*Pholiota squarrosa* (Pers. ex Fr.) Kumm.	05.10.1992. Sérfenyősziget	14.12.1993.
08056	*Pholiota squarroso-adiposa* Lange	12.10.1992. Miskolc	29.09.1994.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
10083	*Piptoporus betulinus* (Bull. ex Fr.) P. Karst.	1955. from Holland collection	13.02.1992.
08036	*Piptoporus betulinus* (Bull. ex Fr.) P. Karst.	27.09.1992. Apátistvánfalva	19.12.1993.
08116	*Pleurotus calyptratus* (Lindbl. ap. Fr.) Sacc.	17.04.1995. Fertőendréd	08.12.1995.
10072	*Pleurotus calyptratus* (Lindbl. ap. Fr.) Sacc.	04.1960. Pusztavacs	12.02.1992.
09105	*Pleurotus cornucopiae* Paul. ex Fr.	30.06.1992. Buda Mts, Csúcs-hegy	21.07.1992.
10086	*Pleurotus cornucopiae* Paul. ex Fr.	18.06.1991. Buda Mts, Normafa	13.02.1992.
08195	*Pleurotus dryinus* (Pers. ex Fr.) Kumm.	03.10.1992. Fertőendréd	16.09.1996.
08196	*Pleurotus dryinus* (Pers. ex Fr.) Kumm.	10.10.1992. Jósvafő	16.09.1996.
10132	*Pleurotus dryinus* (Pers. ex Fr.) Kumm.	12.10.1991. Vitnyéd	09.03.1992.
08104	*Pleurotus eryngii* (DC. ex Fr.) Quél.	21.10.1993. Szob	07.12.1995.
09094	*Pleurotus eryngii* (DC. ex Fr.) Quél.	28.10.1965. Fót	08.07.1992.
10032	*Pleurotus eryngii* (DC. ex Fr.) Quél.	02.10.1972. Kölesd	05.01.1992.
10033	*Pleurotus eryngii* (DC. ex Fr.) Quél.	11.11.1966. Budakalász	05.01.1992.
10055	*Pleurotus eryngii* (DC. ex Fr.) Quél.	1949.	10.02.1992.
10112	*Pleurotus eryngii* (DC. ex Fr.) Quél.	24.10.1991. Zebegény	26.02.1992.
10182	*Pleurotus eryngii* (DC. ex Fr.) Quél.	04.11.1992. Szob	23.08.1996.
10183	*Pleurotus eryngii* (DC. ex Fr.) Quél.	20.10.1992. Szob	23.08.1996.
07151	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	13.12.1992. Buda Mts, Hűvösvölgy	21.08.1996.
07153	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	03.12.1992. Diósjenő	21.08.1996.
07155	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	03.12.1992. Fertőendréd	21.08.1996.
08174	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	29.09.1992. Buda Mts, Csíki-hegyek	21.08.1996.
08175	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	01.11.1992. Sérfenyősziget	21.08.1996.
08176	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	07.11.1992. Budapest, Gombavizsgáló	21.08.1996.
08183	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	08.11.1992. Budapest, Akadémiai-erdő	22.08.1996.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
08184	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	11.11.1992. Márianosztra	22.08.1996.
08185	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	10.10.1992. Fertőendréd	22.08.1996.
08186	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	13.12.1992. Fertőd	28.08.1996.
09011	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	21.11.1990. Budapest, Kamara-erdő	16.04.1992.
09012	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	30.10.1990. Balatonszepezd	16.04.1992.
10031	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	1952.	06.02.1992.
10034	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	1972. Vietnam, from Pham Van Ut	06.02.1992.
10174	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	29.10.1973. from Véssey	22.04.1992.
10184	*Pleurotus ostreatus* (Jacq. ex Fr.) Kumm.	11.11.1992. Emőd	28.08.1996.
09111	*Pleurotus pulmonarius* Fr.	08.06.1992. Visegrád Mts, Lajos-forrás	22.07.1992.
09112	*Pleurotus pulmonarius* Fr.	06.06.1992. from Szántó Mária	22.07.1992.
09113	*Pleurotus pulmonarius* Fr.	16.06.1992. Döbrönte	22.07.1992.
09136	*Pleurotus pulmonarius* Fr.	28.06.1992. Hangony	30.07.1992.
09181	*Pleurotus pulmonarius* Fr.	27.09.1992. Farkasfa	28.08.1996.
09182	*Pleurotus pulmonarius* Fr.	21.09.1992. Szendrő	28.08.1996.
09183	*Pleurotus pulmonarius* Fr.	15.10.1992. Velem	28.08.1996.
09184	*Pleurotus pulmonarius* Fr.	28.07.1996. Sopron	22.08.1996.
10015	*Pleurotus pulmonarius* Fr.	28.07.1990. Bükk, Őserdő	30.01.1992.
10185	*Pleurotus pulmonarius* Fr.	29.09.1992. Fertőendréd	28.08.1996.
09185	*Pleurotus pulmonarius* Fr.	06.10.1995. from Kovács Ferenc	22.08.1996.
09186	*Pleurotus* sp.	10.04.1994. from Értekes Lajos	22.08.1996.
09065	*Pluteus curtisii* (Bk. et Br.) Sacc.	21.09.1966. Isaszeg, Szentgyörgy-puszta	19.06.1992.
09095	*Polyporus arcularius* (Batsch) Fr.	23.04.1992. Szigetmonostor, Horány	08.07.1992.
08013	*Polyporus arcularius* (Batsch) Fr.	08.09.1992.	16.12.1993.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
08012	*Polyporus brumalis* (Pers.) ex Fr.	16.10.1992. Kétvölgy	16.12.1993.
09106	*Polyporus squamosus* (Huds.) Fr.	30.06.1991. Buda Mts, Csúcs-hegy	21.07.1992.
09165	*Polyporus squamosus* (Huds.) Fr.	12.10.1992. Sérfenyősziget	14.12.1993.
08105	*Polyporus tuberaster* Fr.	30.05.1995. Budapest	28.08.1996.
10081	*Polyporus tuberaster* Fr.	14.06.1987. Buda Mts, Normafa	13.02.1992.
10181	*Polyporus tuberaster* Fr.	20.06.1992. Fertőendréd	28.08.1996.
10206	*Polyporus tuberaster* Fr.	25.05.1996. Buda Mts, Normafa	26.08.1996.
10085	*Psathyrella candolleana* (Fr.) Mre.	1951.	13.02.1992.
10066	*Psathyrella hydrophila* (Bull. ex Merat.) Mre.	1948.	11.02.1992.
08074	*Psathyrella velutina* (Pers. ex Fr.) Sing.	22.09.1992. Szin, Kopolya-völgy	26.09.1994.
08146	*Psilocybe cyanescens* Wakefield	26.10.1994. Börzsöny, Kemence-völgy	13.12.1995.
08125	*Rhodocybe popinalis* (Fr.) Sing.	22.09.1995. Szászberek	11.12.1995.
09064	*Rhodocybe truncata* (Schaeff. ex Fr.) Sing.	1954.	19.06.1992.
10051	*Schizophyllum commune* Fr. ex Fr.	1955. from Holland collection	10.02.1992.
10056	*Serpula lacrimans* (Wulf. in Jacq. ex Fr.) Schroeter	08.1960. Sopron	10.02.1992.
09175	*Sparassis crispa* (Wulf.) ex Fr.	27.09.1992. Kétvölgy	15.12.1993.
09066	*Stropharia aeruginosa* (Curt. ex Fr.) Quél.	09.1966. Buda Mts	19.06.1992.
10082	*Stropharia coronilla* (Bull. ex Fr.) Quél.	1949.	13.02.1992.
10146	*Stropharia rugosoannulata* Farlow ex Murr.	03.10.1970. from Véssey	10.03.1992.
10036	*Trametes hirsuta* (Wulf. ex Fr.) Pilát	1955. from Holland collection	05.01.1992.
08086	*Trametes hirsuta* (Wulf. ex Fr.) Pilát	04.10.1995. from Jakucs Erzsébet	05.12.1995.
08106	*Trametes hirsuta* (Wulf. ex Fr.) Pilát	1995.	07.12.1995.
10165	*Trametes versicolor* (L. ex Fr.) Pilát	01.08.1959. Buda Mts, Csúcs-hegy	10.04.1992.
10175	*Trametes versicolor* (L. ex Fr.) Pilát	07.05.1963. Budakeszi	22.04.1992.
10176	*Trametes versicolor* (L. ex Fr.) Pilát	08.10.1982. Aggtelek	22.04.1992.
07195	*Tricholoma scalpturatum* (Fr.) Quél.	19.09.1995. Miskolc	30.07.1997.

Table 1 (continued)

Code	Species	Collecting data	Date of freeze
08166	*Volvariella bombycina* (Schaeff. ex Fr.) Sing.	10.08.1995. from Bőhm Éva	18.12.1995.
10154	*Volvariella volvacea* (Bull. ex Fr.) Sing.	04.07.1973. China	13.03.1992.
10054	*Volvariella volvacea* (Bull. ex Fr.) Sing.	20.06.1976. from Véssey	12.02.1992.
08126	*Xylaria polymorpha* (Pers. ex Mérat) Greville	25.09.1995. Nagycenk	11.12.1995.

REFERENCES

HWANG, S. (1968): Investigation of ultra-low temperature for fungal cultures. I. An evaluation of liquid nitrogen storage for preservation of selected fungal cultures. – *Mycologia* **60**: 613–626.

KNEEBONE, L. R., HWANG, S. W., SCHULTZ, P. G. and PATTON, T. G. (1974): Comparative production performance of stock cultures of eight strains of Agaricus bisporus preserved by liquid nitrogen freezing and by repeated vegetative transfer. – *Mushroom Sci.* **9**(1): 229–235.

LOCSMÁNDI, CS. (1992): Makrogomba-kultúrák hosszútávú fenntartása. (Long-term preservation of mushroom culture collection). – *Mikol. Közlem., Clusiana* **31**(1–2): 35–48.

RIMÓCZI, I. (1997): Magyarország nagygombáinak természetvédelmi helyzete és a Vörös Könyv terve. (Plan of the Red Book and the position in nature conservation of the Hungarian mushrooms). – *Mikol. Közlem., Clusiana* **36**: 65–108.

SILLER, I. and VASAS, G. (1993): Védelemre javasolt magyarországi nagygombák. (List of the mushrooms recommended for protection in Hungary). – *Mikol. Közlem., Clusiana* **32**: 75–80.

SILLER, I. and VASAS, G. (1995): Red List of macrofungi of Hungary (revised edition). – *Studia bot. hung.* **26**: 7–14.

SIMIONE, F. P., DAGETT, P., GRATH, M. and ALEXANDER, M. T. (1977): The use of plastic ampoules for freeze preservation of microorganisms. – *Cryobiology* **14**: 500–502.

VASAS, G., BOHUS, G. and LOCSMÁNDI, CS. (1998): Gombagénbank a Magyar Természettudományi Múzeum Növénytárában. (Mushroom culture collection in the Botanical Department of the Hungarian Natural History Museum). – *Mikol. Közlem., Clusiana* **37**(1–2): 41–54.

(Received 15 March, 1999)