CORVINUS UNIVERISTY OF BUDAPEST

CULTIVATION POSSIBILITIES FOR PRODUCTION OF REISHI GANODERMA LUCIDUM (CURT.: FR.) KARST IN HUNGARY

Thesis of PhD Dissertation

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Research Background and Objectives

According to literature data the world of mushrooms comprises almost 1 million species. Among them, on the other hand, the number of the species identified so far is even less than one-tenth of them el (Laessoe, 1998). In the first place, they play an irreplaceable role in the decomposition of organic materials in nature. Based on their functions in decomposition, on their mode of life, habit and arrangement-kinship several different classifications are possible and known. As a result, their artificial propagation differs from that of plants also because of their growing or cultivation, specific reproduction and typical physiological characteristics. Their growing or cultivation became capable of producing high and stable yields only from the end of the 19th century because of their special requirements and mode of reproduction. Thus, it is only over the past 100 years or so that a mushroom growing with high and safe yields can said to exist. During the past decades, besides the Agaricus species, 6-8 mushroom species have already been successfully brought into cultivation. However, some of them have not become common in cultivation, mainly for reasons of profitability, e.g. Coprinus comatus (Muller:Fries) S.F. Gray and Stropharia rugosoannulata (Farlow apud Murrill) or their consumption did not become popular because of their taste or for some other reason (Pholiota nameko (T. Ito)). The methods of cultivation can differ considerably even between the individual groups of macro-fungi. Among the saprophytic species, the earliest and most exhaustive solutions have been provided for the cultivation of the button mushroom Agaricus bisporus (J. Lge). Solutions for the cultivation of other saprophytic species, in parallel to the possibilities for their use, yet are less developed or completely inexistent. For example, the wood blewit Lepista nuda (Bull.) Cook) is one of the very promising species but no solution has been found how to bring it into cultivation even after long experiments due in the first place to its long growing period and for basic biological reasons not fully understood till now. In a similar manner, we can mention the possibility to bring the Langermannia gigantea (Barsh.: Persoon) into cultivation which, also for a number of reasons seems now rather ‘hopeless’.

It has taken several years to elaborate a growing technique for the facultative parasitic mushrooms (Pleurotus sp, Lentinula sp.) belonging to the other important group.

According to the classification on the basis of the mode of life, mycorrhizal species belong to the third group. Their production on an artificial substrate seems currently insoluble. The majority of the varieties listed as brought into cultivation or suitable for being brought into cultivation are consumed as food. On the other hand, there are also some species which are unsuitable for consumption due in the first place to their taste or to the characteristic consistency of the flesh the fruiting body (Ganoderma sp.), but can be used for other purposes, e.g. healing or decoration, due to the ornamental character. Therefore, instead of gathering from the wild a solution must be found for

their cultivation. The use of the so-called healing mushrooms is particularly widespread the Far East where their role in popular medicine is still very significant. Over the last decades, a number of books have been published on mushrooms used for healing. These literary sources describe, in the first place, the investigations into the active ingredients of the species recommended for therapeutic use and the special medical area. On the other hand, scarce data and information are provided on how to grow these species. This can also be explained by the fact that these mushroom species can be found in the wild and their ingredients can be extracted even after storage. In my view, their use in greater quantities will become possible only through cultivation.

The concept of healing mushroom is also somewhat unclear as each of the species produced for consumption or picked in the wild has a therapeutic effect of one kind or another. It is almost evident that the active ingredients of mushrooms, composed mainly of polysaccharides, have a beneficial influence on blood sugar level and a positive effect on the cholesterol level, too, and can also influence blood pressure levels. Therefore, each of the comestible species are useful in the maintenance of health and in the strengthening of the immune system. Still, officially, for some specific diseases the so-called healing mushrooms can offer even more than mentioned above. In this sense at the present moment the best known and most valuable comestible mushroom is the cultivated shiitake (Lentinula edodes (Berkeley)). Also, the category of healing mushroom can be applied to several other species already introduced into cultivation or so far not cultivated (Grifola frondosa (Dicks:Fr.) S.F.Gray, Ganoderma lucidum (Curt.: Fr.) Karst).

More recently, strong demands have arisen for Ganoderma lucidum (Curt.: Fr.) Karst as an inedible mushroom for therapeutic purposes. Its therapeutic effect has been demonstrated in a number of cases therefore its importance is increasing. The number of the pharmaceutical products that can be made from it is ever higher and pharmaceutical products made from it have become commercially available also in Hungary. There are a great number of references in literature on the medicinal effect of Ganoderma which provide information on its therapeutic applicability. On the other hand, very few publications or other texts in the literature exist concerning the production technology of Ganoderma and similarly no experimental data are available which would offer a detailed discussion of the problems of production. This way, the mushrooms that play an important medical role do not yet have cultivation technologies permitting an economic and reliable production like the ones elaborated for Agaricus bisporus (J. Lge), and Pleurotus spp. Due to the ever broadening future demands the raw material for pharmaceutical products can only be provided by the cultivated Ganoderma sp.

Also because of the reasons listed, I focused my research efforts on developing a solution for the reliable and economic cultivation of Ganoderma lucidum (Curt.: Fr.) Karst therefore trying to answer the following fundamental questions under the conditions given to me.

Selection, and farm scale cultivation, of the 2-3 species/strains already known internationally and commercially available that could be considered as the most suitable at present both in terms of product quantity and quality.

Selection of the strains most suitable for ornamentation, the other possible use of the mushroom species.

Based on the findings of research work carried out so far, the most essential condition for the mushroom is the substrate. Production of a more modern and more productive substrate that the substrates used also abroad.

Collection of information on the fundamental biological requirements of Ganoderma lucidum (heat, light, water and air), changes in the growing period, flushes, yields and crop quality of the strains and substrates studied.

Determination of the chemical element composition of the pulverized fruiting body of Reishi and that of the substrates of different compositions, on the basis of the laboratory analyses available.

Measurement and evaluation of the dry matter production Reishi.

Material and Method

My preliminary laboratory experiments were conducted in 2004, 2005, 2006 and 2007 at the laboratory of the Department of Plant Physiology and Biochemistry and then at the Mushroom Laboratory of the Department of Vegetable and Mushroom Growing, Szent István University, then Corvinus University of Budapest. The experiments on cultivation were carried out at the Vegetable Crops Research Institute Co. Ltd in Kecskemét. The preliminary laboratory experiments were set up at the departments listed. The cultivation experiments were carried out in the cellar of the Mushroom Division of Vegetable Crops Research Co. Ltd.

In the preliminary experiments I studied the mycelium growth of the different Reishi strains at different temperature values.

In the cultivation experiment I observed the requirements and growth vigour of the mushroom strains already selected, besides examining the physical properties of the substrates, too.

The experiment was conducted using 8 Reishi strains. 6 of the strains came from Germany and 2 from Hungary. The strains received were given the following designations: GA 01, GA 02, GA 03, GA 04, GA 05, GA 06, GLL, PV1. The designations of the strains were in accordance with the names given by the mushroom researchers. Relative to the Reishi strains received, unfortunately I had no information on the place of collection or on the requirements of the strains. Each of the strains received from the fellow researchers originated from species occurring in the wild.

Cultivation experiments in 2004

The experiment was conducted using 8 Reishi strains. The mushroom spawn was produced on cereal grains. The tests were carried out using 3 different substrates.

The 3 different substrates were designated and composed as follows:

1 (70% beech sawdust, 20% bran, 10% lime)
2 (80% beech chips, 15% corn grit, 5% bran)
3 (100% wheat straw)

The designations of the strains: GA 01, GA 02, GA 03, GA 04, GA 05, GA 06, GLL, and PV1.

Cultivation experiments in 2005

In 2005 the experiments were again carried out in Kecskemét. Since in the previous year I concluded from the results that several strains were unsuitable for further cultivation (did not produce fruiting bodies, the colonization was too slow), therefore the subsequent experiments were conducted using only 4 strains.

The four strains were the following: GA 01, GA 02, GA 06 and GLL. The substrates remained the same as in the previous year but our observations were extended to sawdust of other tree species. The preparation and the inoculation of the substrates were carried out in accordance with the previous year.

The 6 different substrates were designated and composed as follows:

1 70% beech chips, 20% wheat bran, 10% lime
2 70% beech sawdust, 20% wheat bran, 10% lime
3 70% black pine sawdust, 20% wheat bran, 10% lime
4 70% sessile oak sawdust, 20% wheat bran, 10% lime
5 70% turkey oak sawdust, 20% wheat bran, 10% lime
6 70% wheat straw, 20% wheat bran, 10% gypsum

Cultivation experiments in 2006

In 2006 the experiments were again located at the cellar of the Mushroom Division of Vegetable Crops Research Co. Ltd. The strains examined and cultivated were not changed. I studied the following 4 strains: GA 01, GA 02, GA 06 and GLL.

Some changes were made to the substrates. In the light of the preceding results, those substrates that had produced a low number of fruiting bodies of poor quality were eliminated and instead of them new ones were tested.

The substrates were designated and composed as follows:

1 70% poplar sawdust, 20% wheat bran, 10% lime
2 70% turkey oak sawdust, 20% wheat bran, 10% lime
3 70% black pine sawdust, 20% wheat bran, 10% lime
4 70% beech sawdust, 20% wheat bran, 10% lime

Cultivation experiments in 2007

This year again I tested those substrates that had produced reliable yields and quality in the previous years. No changes were made in the strains and I continued the trials using the four strains that had already been proved successful previously. The substrates were designated and composed as follows:

1 70% turkey oak sawdust, 20% wheat bran, 10% lime
2 70% black pine sawdust, 20% wheat bran, 10% lime
3 70% beech sawdust, 20% wheat bran, 10% lime
4 70% poplar sawdust, 20% wheat bran, 10% lime
5 70% sessile oak sawdust, 20% wheat bran, 10% lime

This way colonization took place always at the spawn running room of the institute at a temperature of 27-30°C.

The primordia initiation and cropping took place in the cellar of the institute. Here the temperature ranged between 20-25°C, the humidity between 85-95% and the CO_2 content ranged between 1000-2000 ppm (during the fruiting body development we tried to maintain a somewhat higher value). The onset of fruiting and the development of the fruiting body are expressed in days.

Results

Conclusions from in vitro experiment results

Based on the experiments carried out I determined the appropriate temperature values required by the different strains for colonization and from this the temperature requirements of the respective strains were deduced. I carried out subsequent investigations based on the results obtained and evaluated also during the cultivation experiments. The temperature of the growing room was set according to the temperature values required for colonization as determined for the individual strains. Based on my research, the following conclusions were drawn on colonization in the case of the strains tested:

Strain GA 01

- The strain requires 9 days for substrate colonization. The desired temperature value is 30°C. This strain is one of the fast growing strains producing strong mycelial mass. It is to be regarded rather as warm requiring, since colonization was very slow at lower temperatures or did not even start.

Strain GA 02

- Based on the results, the strain is one of vigorous growth and was able to fully colonize the substrate in 8 days.
- Besides, it requires higher temperatures as it also needed 30°C for good colonization. According to the experiments, this is clearly the temperature at which this mushroom strain will have strong development. This strong growth can also be seen from the fact that after 8 days the mushroom had already fully colonized the substrate in the Petri dish and thus it was impossible to perform further examinations.

Strain GA 03

- This is also a mushroom of strong and good growth vigour. It grows fast and we achieved complete colonization already in 8 days. It is warm requiring: 30-33°C are necessary for its good growth. At temperatures lower than this the mycelium was over-aged and then the colonization stopped and eventually the mycelium died.

Strain GA 04

- This strain had the strongest development. I obtained complete colonization already in 5 days. It required 24-27°C for colonization. Of all the strains it was this that produced the most uniform and nicest mycelial mass. Therefore, it proved to be a very good strain based on the preliminary experiments.

Strain GA 05

- The colonization of this strain was slow and protracted. I managed to achieve complete colonization only by the 11^{th} day. Its temperature requirement is more within the lower

range as 24-27°C were sufficient for colonization. This was the strain that was very slow to start colonizing at each of the temperatures. The reason of this phenomenon is not yet clear.

Strain GA 06

- The strain is very aggressive and was characterized by vigorous growth at almost every temperature. It was surprising that it had the fastest growth even at the temperature of 27°C. In 8 days its mycelium formed a complete cover over the substrate in the Petri dish. It was also found to be susceptible to start aging early and in this stage its mycelium will turn brown but will grow strongly even in this state. This was observable also in each of our subsequent examinations.

Strain PV1

- The strain has a nice uniform growth. The examinations showed that at 27-30°C the substrate was very nicely colonized in 9 days. Mycelium growth was average with a non aggressive but more of a steady growth.

Strain GLL

- The strain can be classed among the 'average' strains. It took 11 days for its mycelium to colonize the substrate of the Petri dish. The optimal temperature was around 30°C. In growth it is somewhat slow, but very uniform. Sooner or later will complete colonization almost at every temperature. Its mycelium is nice and uniform.

On the whole, I determined the temperature requirements of the individual strains at colonization. It can also be seen that almost every strain seems to prefer the higher temperature, therefore the species is clearly warm requiring, as already confirmed by the data from the literature.

Conclusions from cultivation experiments

The average of the three years provides a good indication of the most suitable substrate for the respective strain. Based on this, it can be concluded that:

- The most suitable substrates for the strain designated as 1 (GA 01) are the ones made of turkey oak and poplar sawdust. The mixtures made of beech and black pine sawdust can be excluded without any doubt. This difference is significant at the 5% probability level. It can also be seen that the strain had very good performance in 2005 on the enriched wheat straw substrate, too.
- The strain designated as 2 (GA 02) produced the highest yield on the substrates made of beech sawdust and poplar sawdust. A reliable and economic cultivation can be achieved on these substrates. According to my experiments, the strain cannot be grown on the mixture made of turkey oak.

- The strain designated as 3 (GA 03) shows a clear and significant preference for the substrate mixtures made of black pine sawdust. I achieved exceptionally high yields in all three years on this substrate. The strain, too, does not produce worthwhile and economic yields on the turkey oak substrate.
- The strain designated as 4 (GLL) produced clear results. In all three years, two substrates proved favourable for it. The beech sawdust substrate mixture and the turkey oak substrate mixture showed significantly better results than the other ones. These two substrates produced markedly better and nicer yields which were also superior in quantity. The mixture made of black pine sawdust showed a statistical difference. This substrate produced the lowest yield. In 2005, also the enriched wheat straw substrate showed a good performance. In this year the strain produced favourable results on the wheat straw substrate, but the yield achieved on the substrate did not differ significantly from the results achieved on the turkey oak and beech sawdust.

The substrates known from the foreign literature and used successfully abroad are dominantly composed of sawdust. Sawdust in the literatures cited refers mostly to beech and oak sawdust (80%), the other ingredients are wheat bran (18%) and a pH setting or regulating material of some kind ($CaCO_3$). In my experiments I also prepared substrate mixtures composed of sawdust of different tree species, as well as wheat straw and enriched wheat straw substrates for the strains. In contrast to the literature data, in several cases the best performance were achieved not by the substrates made of beech sawdust or sessile oak sawdust but the sawdust of other tree species was also favourable for certain strains. My substrate mixtures applied and recommended are different from the foreign substrate formulae. In my view it is the substrate mixtures recommended by us that will produce the required yield amount and quality under our national conditions.

In my experiments I also concluded that it is the strain designated as 2 (GA 02) that could be produced in the most reliable manner. This is the strain which has the fastest colonization and the highest yields and the nicest fruiting bodies are also obtained from this strain. For the development of a large-scale production clearly I recommend this variety under our national conditions.

I carried out investigations also to decide whether the importance of Reishi, besides its therapeutic effect, is notable in the dry matter content. In the cultivation experiments I observed that the mushroom has a particularly long vegetative period and even as much as half a year may be required for the ‘maturity’ of the fruiting bodies, i.e. for the start of harvesting. The long vegetative period, compared to the other mushrooms grown presently on a farm-scale, according to my investigations, is accompanied by a very high dry matter content. The dry matter content of the button mushroom, which is actually the value of the mushroom, is only 3.31 kg/100 kg basic material considering a 35 kg average yield. This value is around 3 kg in the case of the oyster

mushroom. Reishi on the other hand is a mushroom with a very high dry matter content and almost the greater part of the mushroom is 'valuable'. Supposing an average yield of 11,6 kg on 100 kg basic material a dry matter content of almost 17.5 kg is obtained. Thus, almost the whole of the grown mushroom contains valuable materials and much less water.

Summary of results from laboratory analyses and conclusions drawn

Based on the analytical examinations performed I made the conclusion that the powdered fruiting body of Reishi had a very high Ca content. The measured value relative to the Ca content was high, 2-3 times higher on certain substrates, compared to the species presently under cultivation. These results are undoubtedly interesting. They increase the value of the mushroom species as besides the considerable quantity of biologically active ingredients contained the Ca content also assists in increasing the role of Reishi in medicine.

As a result of the analytical examinations I also saw that the K/Na ratio of Reishi was considerable. I compared this value with the value of the K/Na ratio of other cultivated species and concluded that the K/Na ratio of the powdered fruiting body of the mushroom species studied was higher than that of all the species presently in cultivation. This observation also increases the importance of the mushroom, as the consumption of the mushroom powder or tea of Reishi or the capsule made from the fruiting body is beneficial for those suffering from various vascular diseases.

Description of the cultivation technology of Reishi according to the examinations carried out

The cultivation technology of the mushroom was described relative to the strain GA 02 showing the best performance. These cultivation parameters should be maintained for the development of a large scale production technology of Reishi (table 1.).

Table 1. The cultivation technology of Reishi

Colonization		
Temperature	Humidity	Quantity of light
30°C	90-95%	
Onset of primordia formation		
Temperature	Humidity	Quantity of light
20-25°C	85-95%	200-500 lux
Cropping period		
Temperature	Humidity	Quantity of light
20-22°C	80-85%	500-1000 lux

The first step of the cultivation technology is the preparation of the substrate. Based on the results, the most suitable substrate for the strain GA 02 is the one containing beech sawdust. According to my examinations the other crucial issue of the cultivation technology is humidity. It is very important to ensure the very high humidity seen here, as according to my experiments a lower humidity will not favour either the colonization or the development of the fruiting bodies. After the formation of the fruiting bodies humidity can already be lowered.

The vegetative period is as follows. colonization will be accomplished within maximum 10 days at the optimal temperature and approximately one and a half months are required from colonization before the fruiting bodies appear. This way the vegetative period of the mushroom is almost 90 days.

I also carried out investigations to find out whether a second flush could be obtained after the development of the first flush or the picking. The fruiting blocks were soaked after the first flush subjecting the mushroom to shock, but I did not obtain another flush even in this way.

In response to wetting, the fruiting block was covered with green mould within a few days. I also investigated whether the second flush would start by keeping the spent blocks under conditions according to the parameters determined in the cropping period, but no newer fruiting bodies were produced in this case either. Based on this it can be concluded that the strains in my investigations give only one flush and there is no second flush, in contrast to what was described in the literature. During the series of experiments over 4 years, it was not one single year that a second flush was obtained.

In yield quantity the following results were achieved. The strain GA 02 produced an average of ~11.6 kg fruit on beech sawdust substrate, on 100 kg basic material.

I also treated the issue of mushroom protection. Due in the first place to the characteristic hard fruiting body of the mushroom, no infection occurred in any of the years, despite of the high humidity. Similarly, I did not find any infections caused by animals or fungi or bacteria or viruses. Therefore it can be concluded that Reishi has no known pathogens or pests. When the blocks were soaked in the hope of a second flush the soaking promoted the growth of certain pathogens. It is a general experience that in the not completely hygienic growing facilities infections can slowly or faster develop with the elapse of time.

New scientific results and recommendations for practical application

From the investigations carried out between the years 2004 and 2007 I have obtained the following scientific results which can also be used in the practice:

Based on the results of the pre-experiments in vitro and subsequently those of the cultivation experiments the following conclusions were drawn:

1) Of the 8 strains tested I selected the four suitable for production on a farm scale. Based on the results of the four years I identified the one most suitable for the development of a large scale, intensive technology.

When a farm scale, intensive technology is applied it is clear that the GA 02 strain is recommended for use on a substrate mix made with beech sawdust. The GA 06 strain is by no means recommended for a large scale, intensive production. Though this strain grows vigorously, but develops very few fruiting bodies and has another disadvantage of very intense spore powder formation which could affect growers (pickers) because the spores may cause serious allergic reactions.

The strain GA 01 is also worth considering to broaden the choice as it exhibited a steady and good performance based on the growth vigour and the yield results obtained.

2) Another use of the mushroom is becoming ever more common in ornamental horticulture. In many cases, according to international literature data, the mushroom with or without its substrate is put in pots and used as an interior decoration. It was clearly the GLL strain that was found most suitable for this purpose of cultivation. This strain develops nice, long, straight, antler-shaped fruiting bodies, on the other hand its yields are lower than those of the GA 02 strain.

3) There were significant differences in the requirements for soil nutrients between the strains tested. It seems that the requirements for soil nutrients are more specific than in the case of the Pleurotus sp. or Lentinula sp. I determined the requirements for soil nutrients of the strains tested and developed the formula of the substrate mix suitable for application. I also found out which substrate mix produced the lowest yields with the particular strain used, i.e. was the least suitable for application for that strain. I concluded that, in contrast to the data in the literature, this strain was unable to grow on the substrates containing 100% wheat straw, contrarily to certain facultative parasitic mushrooms. Reishi gave no or very poor yield on the substrate mixes consisting mostly of wheat straw.

4) The parameters encountered during the period of cultivation were recorded relative to the strain that was found most suitable (GA 02), including the environmental requirements of the strains during the different phases of vegetation. Based on the results, by observance of the parameters, a reliable cultivation of the strain is allowed.

5) Through laboratory analyses, I determined the major compositional elements and the macro and micro element contents of Reishi. Up to now we have not found any data either in the national or international literature relative to these analyses. The element composition obtained was compared with the values of other mushroom species presently grown on large scale and the importance of Reishi was evaluated relative to its chemical element composition.

Compared to the chemical compositions available relative to the other cultivated mushrooms, the Ca content seems very high in the case of several strains and substrates. The data available in the literature showed values below 600-700 mg/100g for any other mushroom. Based on our laboratory tests relative to the Ca content in several cases I encountered values even as high as several thousand mg/100 g. The high Ca content promotes the production of vitamin D and together with calcium carbonate strengthens the bones, according to the literature.

The other important result of the analytical tests is the K/Na ratio of the powdered fruiting body of the mushroom. This value, compared to other mushroom species, is high. Therefore, the consumption of Ganoderma mushroom powder is beneficial for people suffering from vascular problems.

6) I also examined the dry matter content of Reishi. When comparing it to other mushroom species I concluded that also Reishi has a very high dry matter content, therefore its use value is much higher (almost by 70%) than that of other mushrooms (button mushroom, oyster mushroom, shiitake). The dry matter production of Ganoderma lucidum is several times superior to that of other mushrooms grown presently on large scale. It means that, depending on the yield, it will produce a more favourable economic result than the other mushrooms already in cultivation.

Conclusion and recommendations

I carried out my experiments in 2004, 2005, 2006 and 2007 in the spawn-run room and cellar of the Mushroom Division of Vegetable Crops Research Institute Co. Ltd in Kecskemét. In the first year of our research work we carried out pre-experiments under in vitro conditions in laboratory at the Department of Plant Physiology and Biochemistry and at the Department of Vegetable and Mushroom Growing, Faculty of Horticulture, Corvinus University of Budapest.

In the investigations I tried to find a substrate mix permitting the elaboration of a large scale intensive production technology for the Reishi mushroom and set myself the objective to select the strain suitable for cultivation and ensuring reliable cultivation technology.

With the help of the suitable substrate and the strain ensuring reliable yields I have managed to work out a cultivation technology description in the case of the environmental parameters playing a key role in cultivation. Based on the few national and much more numerous international research results, as well as on my own research results it can be concluded that the specific values relative to the environmental parameters pertain to the GA 02 strain showing the best performance of the strains tested. These values are valid under the national conditions.

In the light of the test results, when using intensive cultivation technology clearly the GA 02 is recommended for cultivation on substrate mixes containing beech sawdust.

Favourable results can be achieved on smaller farms and on family farms using the GA 01 strain for cultivation also on substrate mixes containing beech sawdust.

The strain designated as GLL producing very nice and decorative fruiting bodies (‘antlers’) is the most suitable for the commercial production of Reishi mushroom as an ornamental plant.

The GA 06 is not recommended for cultivation as this strain is characterized by fluctuating yields and its cultivation is unreliable.

Considering the chemical composition (macro and micro element content) of Reishi, the Ca content of the fruiting body is notably high. Based on my tests, this value can be even as much as 3-4 times greater than that of the mushrooms grown on commercial scale at present.

The dry matter content of the mushroom is also considerable. The fruiting body of the mushroom is tough, unfit for consumption. The dry matter content of the fruiting body is almost 80%. This value is far greater compared to the white button mushroom or to the oyster mushroom. Reishi, besides its remarkable healing effect, is very valuable for its high dry matter content.

Even at the present moment, as the mushroom is unfit for fresh consumption, a number of companies produce capsules and teas using the mushroom powder and sell the latter as food additive health product.

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