

Screening to Mycelium Specifications of *Ganoderma lucidum* (Fr.) Karst (Reishi)

Ganoderma lucidum (Fr.) Karst (Reishi)'nin Miselyal Özelliklerinin İncelenmesi

Research Article

Perihan Güler^{1*}, Fatih Kutluer² and İlknur Kunduz¹

¹Kırıkkale University, Science and Art Faculty, Department of Biology, Kırıkkale, Turkey

²Kırıkkale University, Vocational High School, Mushroom Programme, Kırıkkale, Turkey

ABSTRACT

In this study, morphological and anatomical structures of *Ganoderma lucidum*-Reishi known as immortality mushroom were examined. Part of the tissue of *G. lucidum* was inoculated potato dextrose agar center and they were incubated at 28°C, the dark for a period of 22 days. At the end of the incubation period; mycelium formed white color and very solid tissue. Anatomical studies of spore and mycelium of *G. lucidum* were identified with scanning electron microscopy (SEM) and light microscopy (LM) separately and were micrographied.

Key Words

Ganoderma, *Ganoderma lucidum*, Reishi, Scanning electron microscopy

ÖZET

Bu çalışmada, ölümsüzlük mantarı olarak bilinen *Ganoderma lucidum*-Reishi'un morfolojik ve anatomik yapısı incelendi. *G. lucidum* doku parçası patates dekstroz agar merkezine ekildi ve 28°C'de 22 günlük bir süre için karanlık olarak inkübe edildi. Aşılama döneminin sonunda; misel beyaz renkli ve çok sağlam bir doku oluştu. *G. lucidum*'un spor ve misellerinin anatomik çalışmaları elektron mikroskobu (SEM) ve ışık mikroskobu (LM) ile ayrı ayrı tespit edildi ve fotoğrafları çekildi.

Anahtar Kelimeler

Ganoderma, *Ganoderma lucidum*, Reishi, Scanning electron microscopy

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Correspondence to: Perihan Güler, Kırıkkale University, Faculty of Science and Art, Department of Biology, Kırıkkale, Turkey

Tel: +90 318 357 4242 / 4011

Fax: +90 318 357 24 61

E-Mail: perihanguler71@gmail.com, perihangler@yahoo.com

INTRODUCTION

Far-east is the homeland *Ganoderma lucidum* especially China, Korea and in Japan is known as the most valuable mushrooms. Far-East Asian countries is approximately about time for more than 2000 are known as *Ganoderma lucidum* (Reishi, Ling Zhi), is known in China as mushroom immortality [1]. Japanese and Chinese culture, a significant potential with this fungus is very different names are available: Japanese Reishi or Mannentake (10000 years of mushroom), China and Korea, people or Ling Zhi Ling Chi (Immortality mushroom immortality or plant) to give the name [2]. People living in China, the *Ganoderma lucidum* "auspicious mushrooms" known as the happiness of, health, chance, and is the symbol of a long life. *Ganoderma lucidum* has many different colors and have different names. Red color (akashiba), blue color (aoshiba), yellow color (kishiba), white color (shiroshiba), purple color (murasakishiba), black color (kuroshiba) capability. The medical properties of mushrooms because of the red color on the most are called *Ganoderma lucidum* or the world's most famous red Reishi was known [3]. *Ganoderma lucidum* (Lingzhi or Reishi) has been commonly suggested in East Asia as a potential candidate for prevention and treatment of different diseases, including cancer. *Ganoderma* extracts, in particular *Ganoderma lucidum* (extracts or isolated components), have previously been shown to possess antitumor activities [4]. Chang (1999) [5], stated that the *Ganoderma* species are used for medical purposes and expressed that the *G. lucidum* has been called as "miracle mushroom" due its effects on human health. *Ganoderma lucidum* is very rich as carbohydrates, protein, nucleic acid, triterpenoid, steroid, sterols, fatty acids, beta, vitamins, minerals (potassium, magnesium, calcium, sodium manganese, iron, zinc) [6].

In this study; *Ganoderma lucidum* that natural spreading at our country of anatomical and morphological structures were examined. Anatomical studies were maintained on light (LM) and scanning electron microscopy (SEM).

MATERIAL AND METHODS

Organism

Ganoderma lucidum samples were dried and placed in paper bags and added to thymol tablets not damages.

Morphological studies

Tissue pieces of *Ganoderma lucidum* fructification were incubated potato dextrose agar which sterilized at autoclave for 15 minutes at 121°C. In the dark, at 28°C was inoculated for 22 d. Mycelium that completed colonization period were kept to +4°C in the refrigerator.

Anatomical studies

Basidiospores that received from *Ganoderma lucidum* fructification and developed mycelium that developed on solid agar were examined with Scanning electron microscopy (SEM) and light microscope (LM).

Light microscope studies

Light microscope studies were maintained with Nico Imager A (100x) which found Kirikkale University, Kirikkale Higher Professional School.

Scanning electron microscopy studies

The scanning electron microscope studies were conducted at the Kirikkale University, Electron Microscope Laboratory with JEOL brand microscope.

The *Ganoderma lucidum* samples were washed in 0.2 M sodium phosphate buffer and were divided into small particles. The samples were fixed in 3% glutaraldehyde at +4°C for 1 h. After the first fixation, the samples were washed in pH=7.2 sodium phosphate buffer in 10 minutes sequences with 3 alterations than fixed for 1.5 h at +4°C in the same buffer in 1% osmium tetroxide. The samples were washed in sodium phosphate buffer for whole night in order to banish the osmium tetroxide completely. During the dehydration process, the samples were passed thru 50%, 60%, 70%, 80%, 90%, 95% and 99% absolute ethyl alcohol in 10 minute sequences.

After dehydration process, the samples were placed in Petri dishes and we placed in the incubator and dried at 60°C for 6 nights.

RESULTS AND DISCUSSION

Morphological characteristics

The mycelium started to grow weakly from the center of the agar. Than it gained intensity and showed white pigmentation. During the daily

developments the mycelium formed weak circle around the colonies, next day this circle gained intensity and surrounding had a new weak mycelium development (Figure 1).

Anatomical characteristics

Light microscopy studies

In light microscopy studies; *Ganoderma lucidum* has ellipsoid spores (Figure 2). Septum and mycelium germinating initials were determined on mycelia (Figure 3).

Scanning electron microscopy studies

In the scanning electron microscopy studies; mycelium and spores of *Ganoderma lucidum* were examined. Mycelium has septa and germinating initials were obtained obviously (Figure 4). Spores surface of *Ganoderma lucidum* was not smooth and their size were $92.5-108 \mu\text{m} \times 301-331 \mu\text{m}$ (Figure 5) and spores have germinating point (Figure 6).

Discussion

Ganoderma lucidum-Reishi is known immortality mushroom and is very important mushroom

from medical features. There are a lot of works with this mushroom at World and Turkey and more studies of this fungus is related to medical direction [7]. In this work morphological and anatomical characteristics were examined with light microscope and scanning electron microscopy.

Moncalvo and Ryvarden (1997) [8], have specified that the *Ganodermataceae* members were characterized with basidiospores that has thick double wall structures.

Güzeldağ (2007) [6] in her doctorate thesis's analyzed that the *Ganoder mataceae* species had double layer basidiospores and checked their mycelium structures under 40x and defined the monocaridic hypea structure. Adaskaveg and Gilbertson (1988) [9] have specified that the *Ganoderma* hyphea were ripping the tree slowly and published the micrographs of the hyphea structures. In our study the starting points in the *Ganoderma* mycelium were defined by micrograph. Also the septum in the mycelium was also specified.

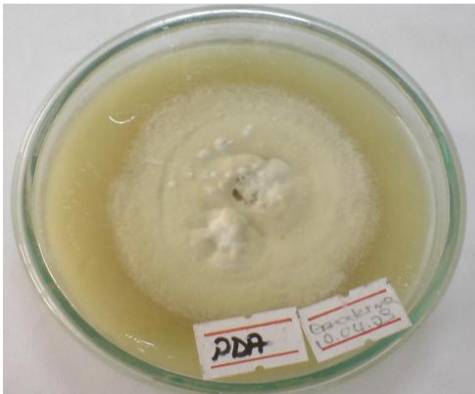


Figure 1. *Ganoderma lucidum* mycelium on PDA.

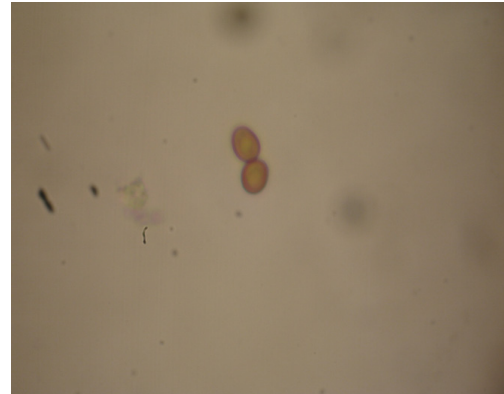


Figure 2. *Ganoderma lucidum* spores (100x).

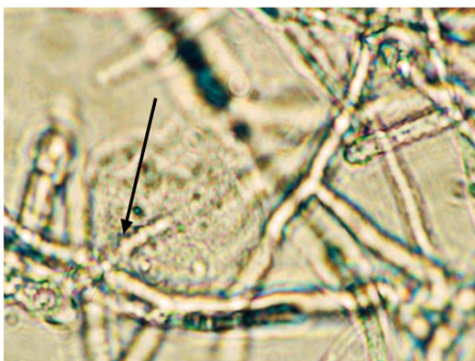
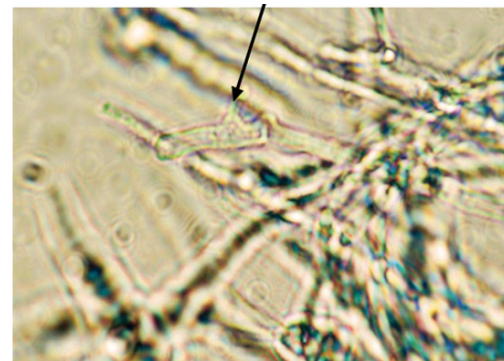


Figure 3. *Ganoderma lucidum* Mycelium (100x). Arrows= Mycelium germinating initial.



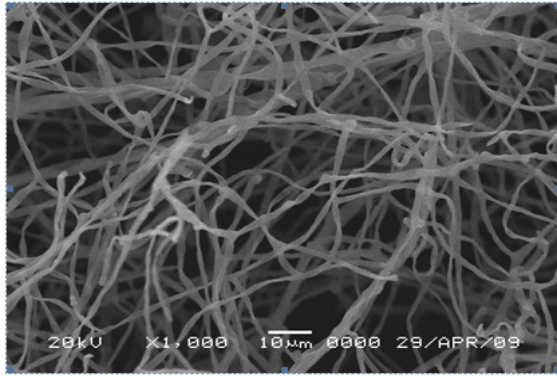


Figure 4. *Ganoderma lucidum* mycelium structure. Black arrow=initial of mycelium; White arrows= septa.

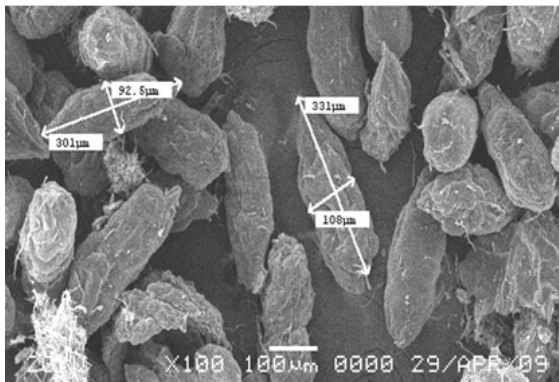
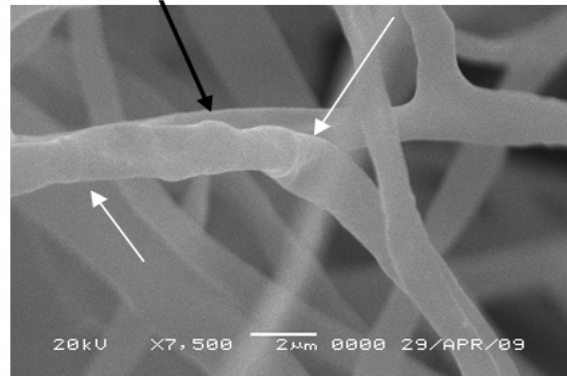


Figure 5. *Ganoderma lucidum* spores.

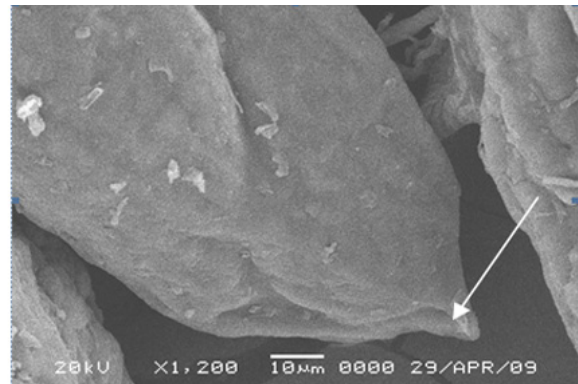


Figure 6. Germinating point of spore.
Arrow= germinating point.

Stamets (2000) [10], stated that the *Ganoderma lucidum* is growing radially without making aerial hyphae, during development it develops parallel to the surface and gains an intensive cover, at the beginning it has white color pigmentation than turns from yellowish to golden yellow. Our findings had similarities with the researchers.

Yen (2008) [2] in his study has analyzed mycelium developments of 2 different *Ganoderma lucidum* strains from Mediterranean Region (Alata and Balcali) and one American commercially produced (Buffalo) strain in solid agars and informed that the fastest mycelium development was in Alata strain with 6-6.5 d.

Ganoderma lucidum (Fr.) Karst from the Polyporaceae members is very important mushrooms of Far East and they have special place in the health world because of their use in therapeutic. Especially it has effects on hepatitis, hypertension, and hypercholesterolemia and stomach cancer. Its structure is made of polysaccharides, proteins and triterpenoides. *G. lucidum* (Fr.) Karst is cultivated on

the different substrates. But the period is very long (6 months) until karpofor formed [11]. Therefore the producers have switched to mycelium production as alternative, because polysaccharides are obtained in shorter period (2 weeks) at the mycelium cultures [12]. In our study, it is been showed that the mycelium develops at 22 days and is suggested that mycelium production must be preferred. Besides the anatomical structure of mushroom which has medical importance were studied, as an aim to understand the structure of used mushroom.

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