Ecological Factors Influencing the Occurrence of Macrofungi from Eastern Mountainous Areas to the Central Plains of Jilin Province, China

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Abstract: Macrofungi are essential in forest ecological functioning. Their distribution and diversity are primarily impacted by vegetation, topography, and environmental factors, such as precipitation and temperature. However, the composition and topographical changes of the macrofungi between the eastern mountainous area and central plains of Jilin Province are currently unknown. For this study, we selected six investigational sites representing three different topographical research sites in Jilin Province to assess macrofungal diversity, and applied a quadrat sampling method. Macro- and micro-morphological characteristics combined with the molecular method were used to identify the collected macrofungi. Meanwhile, selected meteorological data were obtained for statistical analysis. As a result, 691 species were identified, of which Agarics were the most common, accounting for 60.23%, while the Cantharelloid fungi were the least common (0.91%). Furthermore, most of the shared genera (species) were saprophytic. The α diversity showed that the species diversity and richness in Longwan National Forest Park (B2) were the highest at the genus level. The mycorrhizal macrofungi proportion revealed that Quanshuidong Forest Farm (A1) was the healthiest. Finally, species composition similarity decreased with the transition from mountainous to hilly plains. We concluded that the occurrence of macrofungi was most influenced by vegetation. The air humidity, precipitation, and wind velocity were also found to significantly impact the occurrence of macrofungi. Finally, the mycorrhizal:saprophytic ratios and species similarity decreased with the transition from the mountainous area to the plains. The results presented here help elucidate the macrofungi composition and their relationship with environmental factors and topography in Jilin Province, which is crucial for sustainable utilization and future conservation.

Keywords: ecology; environmental factors; forest type; forest health; landform; macrofungi occurrence

1. Introduction

Human beings have discovered and utilized macrofungi throughout history with an awareness of the essential role in forest ecology. Macrofungi form mycorrhizal symbioses with host plants to promote the absorbance of substances, such as mineral elements and water. They also improve the tolerance of host plants to heavy metals, promote the survival and growth of afforestation and seedlings, and improve the diversity and stability of plants in the forest ecosystem. The comprehensive effects of macrofungi on the forest ecosystem are mainly manifested by increasing the plant–soil connections, improving the soil structure, promoting soil microorganisms, enhancing the function of plant organs, resisting...
antagonistic plant root disease pathogens, and degrading wood and other substances [1–4]. Saprotrophic macrofungi are also involved in the material cycle and energy flow, such as decomposing fallen timber and dead wood into other substances, such as lignin, cellulose, and hemicellulose [5,6], finally converted into glucose, fructose, etc.

Forests, as a habitat, are essential for the growth of macrofungi. Studies have shown that canopy openness, vegetation structure, and tree species richness strongly influence the occurrence of macrofungal functional groups [7]. Plant size, tree density, herb richness, and evenness could also affect the macrofungi composition [8]. Wood rotting fungi are strongly associated with tree species and the degree of wood decay [9]. Additionally, the species richness of macrofungi is also significantly related to forest management [10–12].

Topography is an abiotic factor that affects macrofungi community structures, as spatial eigenvectors—for example, slope—strongly connect with macrofungi occurrence [13]. Topography, more importantly, forms micro-habitats, thus creating differences in the key factors such as temperature, air humidity, and light, which affect the occurrence of macrofungi.

Furthermore, the occurrence and growth of macrofungi are closely related to environmental factors. For example, ectomycorrhizal macrofungi (EM fungi) are closely associated with their host plants, as Tuo et al. revealed the quantity of EM fungi in Wunfeng National Forest Park, China, was positively correlated with the occurrence of *Quercus mongolica* [6]. Humidity is another critical factor, and Trudell et al. characterized the epigeous macrofungi communities in two old-growth conifer forests with a high level of similarity in their dominant tree species and proposed that the differences between the macrofungi communities were primarily related to the disparities in ecosystem moisture [14]. In addition, pH [15], soil temperature [16], and organic matter content [17,18] could also affect the occurrence of macrofungi.

There are apparent differences in the topography of Jilin Province. The terrain inclines from southeast to northwest and could be divided into two significant landforms: the eastern mountainous area and the central-western plains. The eastern mountainous area comprises the middle part of Mt. Changbai and its branches [19], accounting for 33% of the total area; hills account for 6% of the area. Due to the unique natural geographical environment and meteorological conditions, Jilin Province has become one of China’s biodiversity hotspots. New macrofungi species have been discovered here, including *Cortinarius laccariphyllus* Y. Li and M.L. Xie; *Cortinarius neotorvus* Y. Li, M.L. Xie, and T.Z. Wei [20]; *Cordyceps changchunensis* J.J. Hu, Bo Zhang, and Y. Li; *Cordyceps changbaiensis* J.J. Hu, Bo Zhang, and Y. Li; and *Cordyceps jingyuetanensis* J.J. Hu, Bo Zhang, and Y. Li [21]. However, the macrofungi distribution patterns and the relationship with the environmental factors are currently unclear.

With this study, we aim to understand the species composition and macrofungal distribution in the central and eastern areas of Jilin Province and analyze the relationship between their occurrence and environmental factors. In addition, we analyze the changes in the macrofungi composition about to topography.

2. Materials and Methods

2.1. Introduction of Investigation Site

Jilin Province has a temperate continental monsoon climate, with four distinct seasons, rain and heat in the same season, noticeable seasonal changes, and regional differences in temperature and precipitation. The average temperature is below $-11^\circ$C in the winter and above $23^\circ$C in the summer [22–24], and the average annual precipitation is 400–600 mm [25–27]. However, precipitation significantly differs between seasons and regions, as 80% is concentrated in the summer, and the eastern area is the richest.

Six representative investigation sites were selected to assess the macrofungi resources and analyze the relationships between macrofungi occurrence in eastern Jilin Province, China, in detail (Figures 1 and 2 and Table 1). These sites are Mt. Changbai area (A)—Quanshuidong Forest Farm (A1) and Lushuihe National Forest Park (A2); Mt. Changbai branches, Mt. Laoyeling branch (B)—Shengli River Forest Farm (B1) and Mt. Longgang
branch—Longwan National Forest Park (B2); and low hilly plain areas (C)—Zuojia Region (C1) and Jingyuetan National Forest Park (C2). The investigation also aimed to improve our understanding of the composition transitions from the eastern to central regions, which cause changes in topography, vegetation, precipitation, and temperature.

Figure 1. Distribution map showing the investigation sites in Jilin Province (A1: Quanshuidong Forest Farm; A2: Lushuihe National Forest Park; B1: Shengli River Forest Farm; B2: Longwan National Forest Park; C1: Zuojia Region; C2: Jingyuetan National Forest Park).

Table 1. Geographical coordinates and vegetation of the investigation sites.

| Investigation Sites                          | Longitude | Latitude | Vegetation                                                                 | Soil Type                                      | Investigation Time |
|---------------------------------------------|-----------|----------|---------------------------------------------------------------------------|-----------------------------------------------|-------------------|
| Quanshuidong Forest Farm (A1)               | 128.89° E | 42.68° N | *Pinus* and broadleaf mixed forest, *Quercus* and *Poplar* forest, coniferous forests (*Pinus koraiensis*), *Taxus cuspidata*, *Salix* spp., etc. | Dark brunisolic soil and planosol soil        | 2014–2016         |
| Lushuihe National Forest Park (A2)          | 128.01° E | 42.55° N | *Pinus koraiensis* and broadleaf mixed forest, larch forest, *Quercus mongolica* forest, *Acer truncatum*, *Tilia amurensis*, and *Fraxinus mandshurica*, etc. | Dark brunisolic soil and planosol soil        | 2013–2015         |
| Mt. Laoyeling (Shengli River Forest Farm, B1)| 127.83° E | 43.69° N | *Pinus koraiensis* and broadleaf mixed forest, larch forest, *Quercus mongolica* forest, *Acer truncatum*, *Tilia amurensis*, and *Fraxinus mandshurica*, etc. | Dark brunisolic soil and planosol soil        | 2005–2007         |
| Mt. Longgang (Longwan National Forest Park, B2) | 126.45° E | 42.37° N | *Quercus mongolica* forest and broadleaf mixed forest                      | Dark brunisolic soil                          | 2011–2013         |
| Zuojia Region (C1)                          | 126.16° E | 44.03° N | *Quercus mongolica* forest, spruce forest, and pine forest                | Black soil and paddy soil                     | 2011–2013         |
| Jingyuetan national forest park (C2)        | 125.48° E | 43.79° N | Larch forest, *Pinus* forest, and *Quercus mongolica* forest              | Dark brunisolic soil                          | 2003–2006         |
Figure 2. Forest types from the investigation sites in Jilin Province. (A) *Betula platyphylla* forest; (B) *Cunninghamia* forest; (C) broadleaf mixed forest (mainly *Acer* sp.); (D–F) Pine forest; (G) *Quercus mongolica* forest; (H) Coniferous and broadleaf mixed forest (*Pinus* and broadleaf mixed forest); (I) *Quercus mongolica* forest.

(1) Quanshuidong Forest Farm (A1)

Quanshuidong Forest Farm, located in Helong City, Jilin Province, belongs to the mid-temperate monsoonal semi-humid climate zone. The annual average temperature is 5.6 °C, and the effective accumulated temperature at 10 °C is 2534.0 °C. The average yearly precipitation is 573.6 mm, and the frost-free period is approximately 138 days [28].
(2) Lushuihe National Forest Park (A2)

Lushuihe National Forest Park, located in Fusong County, Baishang City, Jilin Province, belongs to the temperate monsoon climate. The annual average temperature is 2.9 °C, and the effective accumulated temperature at 10 °C is 2606.9 °C. The average yearly precipitation is 894 mm, and the frost-free period is approximately 110 days [29].

(3) Laoyeling Branch—Shengli River Forest Farm (B1)

Mt. Laoyeling belongs to the Mt. Changbai Systems and is in the northeast–southwest direction, 800–1000 m above sea level in Jilin Province, with a relative height of approximately 500 m. The landforms are mainly low and middle mountains, with narrow valleys between the mountains. Volcanoes and lava flows are widely distributed in this area [27]. Shengli River Forest Farm has a temperate continental climate with an average annual temperature of 3.8 °C, an average annual rainfall of 633.7 mm, and a frost-free period of 110–130 days.

(4) Longgang Mountain Branch—Longwan National Forest Park (B2)

Longwan National Forest Park is in the middle section of Mt. Longgang in Huinan County, Jilin Province, with an average sea level of 880 m. It has a northern temperate continental monsoon climate. The annual average temperature is 4.8 °C, the minimum temperature is −17 °C, and the maximum monthly average temperature is 22.4 °C. The sufficient accumulated temperature at 10 °C is 2728 °C. The average annual precipitation is 837.9 mm, ranging from 436.5 to 987.2 mm. The maximum daily precipitation is 124.2 mm, concentrated from June to August, with an average yearly frost-free period of 138 days and an average sunshine time of 2296 h [30].

(5) Zuojia Region (C1)

The Zuojia area, Jilin Province, belongs to the hilly plain areas of Mt. Changbai. It has a continental climate with temperate monsoons and often experiences Siberian cold waves, with changeable weather and distinct seasons. The annual average temperature is 5.6 °C, and the effective accumulated temperature at 10 °C is 2779.8 °C. The average yearly precipitation is 679 mm, the average annual evaporation is 1200 mm, and the frost-free period is approximately 120 days [31–33].

(6) Jingyuetan National Forest Park (C2)

Jingyuetan National Forest Park is in the transitional zone from the eastern mountain area to the western grasslands of Jilin Province. It belongs to the hill areas of Mt. Changbai. The elevation is between 245.8 and 371.6 m above sea level. The climate is temperate semi-dry, early, and semi-humid monsoon with four distinct seasons. The annual average temperature is 6.1 °C. The average annual precipitation is 577.3 mm. The rainy season is mainly concentrated in July and August, as it accounts for 67% of the annual precipitation, the annual evaporation is 1392.5 mm, and there is a frost-free period of 145 d [34].

2.2. Macrofungi Investigation

(1) Investigation

In this study, four plots were selected at each investigation site in which three quadrats of 10 m × 10 m [35] were set in parallel at each plot, and each plot was numbered with a distance of 300 m, applied with a quadrat sampling method.

(2) Specimen collection and recording

Specimens were mainly collected from July to September at every investigation site. The specimens were photographed in situ. The habitat, altitude, soil characteristics, and nearby trees were recorded. The size of basidiomata was measured when fresh, and features such as striations, hygrophanous, and squama were noted (Figure 3). After examining and describing the fresh macroscopic characters, the specimens were dried in an electric drier at 45–50 °C. All the collected specimens had conspicuous basidiomata.
Figure 3. An example of field record and microscopic observation record of the collected specimen.

(3) Specimen identification

The dried specimens were rehydrated in 94% ethanol for microscopic examination, then mounted in 3% potassium hydroxide (KOH), 1% Congo red, and Melzer’s reagent; they were then examined with a Zeiss Axiolab A1 microscope (Carl Zeiss, Jena, Germany) at magnifications up to 1000×. All measurements were taken from the sections mounted in 1% Congo red. A minimum of 40 spores, 20 basidia/asci, 20 cystidia, etc., were measured from at least two different fruiting bodies for each specimen [36]. When combined with the macroscopic characteristics, the classification status of the specimens was determined by referring to literature and monographs [37]. For some species, we also sequenced, and the sequences have been deposited in GenBank (GenBank accession numbers: ON683416–ON683495). The taxonomic status of all species is referenced in the Index Fungorum [38]. The specimens examined were deposited in the Herbarium of Mycology of Jilin Agricultural University (HMJAU).

(4) Data collection

The meteorological data—average temperature (T), average relative humidity (RH), average monthly precipitation (P), average wind speed, and accumulated temperature from July to September (AT)—were downloaded from the China meteorological data network [39]. The soil type and representative forest type data were obtained from the Chinese Academy of Sciences (Table 2) [40].

2.3. Data Analysis

Two alpha diversity indices, the Simpson diversity index [41] and the Shannon–Wiener index [42], were calculated at the genus level for each investigation site to analyze the community composition of the macrofungi. The Shannon index (H') reflected the diversity of the community species. The Simpson index (D) reflected the probability of two individuals being randomly selected from the same sample, and these two individuals are from the same class.
Table 2. Meteorological conditions and types of soil at the investigation sites.

| Investigation Site                          | The Average Temperature from July to September/°C (T) | The Average Relative Humidity from July to September/% (RH) | The Average Monthly Precipitation from July to September/mm (P) | The Average Wind Speed from July to September/m/s (S) | The Accumulated Temperature from July to September/°C (AT) |
|---------------------------------------------|------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------|
| Quanshuidong Forest Farm (A1)               | 18.60                                                | 80.67                                                    | 152.27                                                       | 1.57                                                 | 1715.90                                                     |
| Lushuihe Town (A2)                          | 19.60                                                | 81.67                                                    | 143.27                                                       | 1.67                                                 | 1698.9                                                      |
| Mt. Laoyeling—Shengli River Forest Farm (B1) | 17.67                                                | 79.00                                                    | 118.63                                                       | 1.90                                                 | 1629.80                                                     |
| Mt. Longgang—Longwan National Forest Park (B2) | 19.53                                                | 78.33                                                    | 170.77                                                       | 1.23                                                 | 1746.40                                                     |
| Zuojia Region (C1)                          | 19.93                                                | 77.00                                                    | 124.43                                                       | 2.03                                                 | 1838.60                                                     |
| Jingyuetan National Forest Park (C2)        | 20.43                                                | 74.00                                                    | 116.03                                                       | 2.83                                                 | 1884.30                                                     |

The compositions of the macrofungi at Mt. Changbai (A), the transitional zone (B), and the plain hilly area (C) were compared by calculating the similarity coefficient (S) [43] and generating a complex heatmap [44]. The macrofungi compositions between Mt. Changbai and Mt. Laoyeling branch and Mt. Longgang Branch were also compared.

The diversity index formulae were as follows:

\[ H' = - \sum Pi \ln(Pi) \]  

\[ D = 1 - \sum Pi^2 \] 

\[ S = \frac{2a}{b+c} \times 100 \]

where \( Pi \) is the proportion of species \( i \) to the total number of individuals of all species in the plot, \( a \) is the number of genera shared by the two places, and \( b \) and \( c \) are the genera that appear in the same place.

According to the Atlas of Chinese Macrofungal Resources [37], identified species were divided into eight categories: Larger Ascomycete, Agarics, Polyporoid, Hyonaceous and Thelephoroid fungi (PHT fungi), Cantharelloid fungi, Gasteroid fungi, Jelly fungi, Coral fungi, and Boletes.

The identified genera were summarized in an Excel table. Then, we specified a value of 0/1 for each genus shown at each investigation site (0 means that the genus did not appear at the investigation site). Originpro 2019 (OriginLab, Northampton, USA) was used to analyze common genera. Dominant family (number of species more than ten of the family) and dominant genus (number of species more than five of the genera) of each investigation site were counted [45]. Moreover, the species numbers per family (genera) at all six investigation sites were statistics, the top ten families (genera) were shown, and the bubble matrix was drowned.

The software Canoco 5.0 (Micro-computer Power, Ithaca, NY, USA) [46] fits and analyzes the relationship between macrofungi species and the environmental factors at six investigation sites. Log \((n + 1)\) was used to reduce meteorological data quality and balance the vast differences among the various factors. The quadat \(\times\) species matrix and the quadat \(\times\) environment matrix were established. Two-dimensional sorting and canonical correspondence analysis (CCA) of macrofungi and environmental factors in six different vegetation types were conducted.

3. Results

3.1. Composition Characteristics of the Macrofungi

In this study, genera with more than four species were chosen from the six investigation sites for analysis. Site A1 included the most identified families and species among six investigation sites, while site B2 had the fewest (Figure 4). General overview, Russula Pers.,
Pholiota (Fr.) P. Kumm., and Mycena (Pers.) Roussel, etc., were the most common genera recorded. Taxa belonging to Russula and Mycena were the most common at site A1; Pholiota and Polyporus were the most common ones at site A2; Russula, Pholiota, and Hygrophorus Fr. were the most reported genera at site B1; Russula and Amanita Pers were the most recorded at site B2; Russula, Suillus Gray, and Pholiota were the most reported at site C1; Russula, Suillus, and Agaricus L., were the most common genera at site C2. Overall, the most reported one is Russula.

Figure 4. Circos plot shows the relative abundance of macrofungi in six different sites in Jinlin Province based on the genera with more than four species. The analysis of species abundance shows Russula was the common genus and site A1 contains more species than the other five investigation sites. A1: Quanshuidong Forest Farm; A2: Lushuihe National Forest Farm; B1: Shengli River Forest Farm; B2: Longwan National Forest Park; C1: Zuojia Region; C2: Jingyuetan National Forest Park.

Figure 5A. A total of 691 species of macrofungi, belonging to 258 genera and 81 families, were identified (Table A1). There were 23 genera—including Ampulloclitocybe Redhead, Lutzoni, Moncalvo and Vilgalys, Cortinarius, and Pleurotus—identified at all six investigation sites.
3.2. Shared Genera (Species) Analysis

A total of 691 species of macrofungi, belonging to 258 genera and 81 families, were identified (Table A1). There were 23 genera—including *Ampulloclitocybe* Redhead, Lutzoni, Moncalvo and Vilgalys, *Cortinarius*, and *Pleurotus*—identified at all six investigation sites (Figure 5A).

Furthermore, 11 species, such as *Ampulloclitocybe clavipes* (Pers.) Redhead, Lutzoni, Moncalvo and Vilgalys, *Daldinia concentrica* (Bolton) Ces. and De Not., and *Ganoderma applanatum* (Pers.) Pat., co-occurred at each survey site (Figure 5B). Site A1 has the most endemic species, while site B2 has the fewest.

3.3. Macrofungi Composition Types Analysis

According to the *Atlas of Chinese Macrofungal Resources* [37], the macrofungi species were divided into eight statistical categories. Agarics were the most common, accounting for 60.23% of the total, followed by PHT fungi, accounting for 16.50%. In contrast, Jelly fungi and Cantharelloid fungi were rarely reported, accounting for 2.06% and 0.91%, respectively (Figure 6A).

The statistical analysis of each investigation site (Figure 6B) showed that Agarics and PHT fungi were predominant at sites A1, A2, B1, B2, C1, and C2, while Agarics and Jelly fungi were the most common at site B2. Coral fungi and Cantharelloid fungi were rarely reported at sites A1, A2, and B2. Jelly fungi and Cantharelloid fungi were seldom reported at sites B1, C1, and C2. In summary, Cantharelloid fungi were rare in all investigations, while the compositions of macrofungi at six investigation sites were vastly different.
Figure 6. Distribution proportions for different types of macrofungi in six different investigation sites from Jilin Province. (A) Analysis of all recorded species composition types of our investigation sites; Agarics were the most common macrofungi while Cantharelloid fungi were rare. (B) Species composition type analysis of every investigation site; Agarics were predominant at every site, Cantharelloid fungi were rare at all sites, and the compositions of macrofungi at six investigation sites were enormously different. PHT fungi: Polyporoid, Hyonaceous and Thelephoroid fungi; A1: Quanshuidong Forest Farm; A2: Lushuihe National Forest Park; B1: Shengli River Forest Farm; B2: Longwan National Forest Park; C1: Zuojia Region; C2: Jingyuetan National Forest Park.

3.4. Ecological Characteristics of Macrofungi

According to the reference [6] and FUNGuild [47], the numbers of mycorrhizal macrofungi and saprophytic macrofungi were counted. The proportion of mycorrhizal macrofungi at site A1 was the highest (0.47), indicating that the forest structure at this site was the healthiest and the most stable. While the proportion was the lowest at site C1 (Table 3).

Table 3. Mycorrhizal:saprophytic macrofungi ratios of the investigation sites from Jilin Province.

| Sites | A1 | A2 | B1 | B2 | C1 | C2 |
|-------|----|----|----|----|----|----|
| Mycorrhizal | 92 | 76 | 77 | 30 | 60 | 57 |
| Saprophytic | 197 | 170 | 181 | 75 | 196 | 175 |
| Ratio/% | 0.47 | 0.45 | 0.43 | 0.40 | 0.31 | 0.33 |

3.5. Analysis of α Diversity

The α diversity at six investigation sites was analyzed (Figure 7). The summary statistics from the Simpson diversity index for site B2 were significantly higher than those from the other five investigation sites. This result indicated that site B2 had the richest species diversity at the genus level and the most uniform distribution of species quantity (Figure 7A). The Shannon–Wiener index results also indicated that the diversity at site B2 was the highest, and the species were the richest (Figure 6B).

3.6. Analysis of Dominant Families (Genera)

According to the identification results, 81 families were recorded. The top ten families were Russulaceae, Tricholomataceae, Agaricaceae, etc., successively, containing 43.54% of the total species (Table 4). There were 24 families with only one species, accounting for 29.63%. The dominant families at each investigation site are shown in Figure 8A.

A total of 258 genera were reported in this study, among which the top ten genera were Mycena (Pers.) Roussel, Cortinarius (Pers.) Gray, Lactarius Pers., etc., accounting for 22.46% (Table 4). There were 137 genera with only one species, accounting for 53.10%. The dominant genera are shown in Figure 8B.
Figure 7. Diversity index analysis at genus level in six different investigation sites from Jilin Province. (A) Simpson diversity analysis in six different investigation sites from Jilin Province; the Simpson diversity index revealed site B2 was higher than the other five sites. (B) Shannon–Wiener diversity analysis in six different investigation sites from Jilin Province; the Shannon–Wiener diversity analysis showed site B2 was higher than the other five investigation sites. This result indicated that site B2 had the richest species diversity at the genus level and the most uniform distribution of species quantity. A1: Quanshuidong Forest Farm; A2: Lushuihe National Forest Park; B1: Shengli River Forest Farm; B2: Longwan National Forest Park; C1: Zuojia Region; C2: Jingyuetan National Forest Park.

Table 4. Top 10 families and genera in six different investigation sites from Jilin Province.

| No. | Family            | Numbers of Species | Percentage | Genus     | Numbers of Species | Percentage |
|-----|-------------------|---------------------|------------|-----------|-------------------|------------|
| 1   | Agaricaceae       | 52                  | 7.07%      | Lactarius | 20                | 2.72%      |
| 2   | Polyporaceae      | 50                  | 6.80%      | Mycena    | 19                | 2.59%      |
| 3   | Tricholomataceae  | 41                  | 5.58%      | Cortinarius| 18               | 2.45%      |
| 4   | Inocybaceae       | 34                  | 4.63%      | Marasmius | 18                | 2.45%      |
| 5   | Strophariaceae    | 33                  | 4.49%      | Pholiota  | 18                | 2.45%      |
| 6   | Hygrophoraceae    | 25                  | 3.40%      | Agaricus  | 16                | 2.18%      |
| 7   | Marasmiaceae      | 25                  | 3.40%      | Entoloma  | 16                | 2.18%      |
| 8   | Mycenaceae        | 23                  | 3.13%      | Amanita   | 14                | 1.90%      |
| 9   | Cortinariaceae    | 19                  | 2.59%      | Crepidotus| 13                | 1.77%      |
| 10  | Omphalotaceae     | 18                  | 2.45%      | Inocybe   | 13                | 1.77%      |

3.7. Relationships between Macrofungi and Environmental Factors

At first, the number of macrofungi collected from May to October at the three investigation sites was analyzed statistically. The results showed that they mainly arose from July to September, with minimal presence in May, June, and October (Figure 9).

Secondly, the relationship between macrofungi and environmental facts—air humidity, precipitation, and temperature were also analyzed. Macrofungi occurrence was positively correlated with air humidity (Figure 10). When air humidity was higher, larger numbers of macrofungi were shown from July to September. Precipitation from May to October was positively correlated with macrofungi occurrence with a lag period (Figure 11).

Then, the relationship between the average temperature from May to October and macrofungi occurrence was also analyzed. The results showed that macrofungi occurrence at sites A1 (Figure 12A) and B2 (Figure 12B) was positively correlated with air temperature, and there was a relative lag period. However, numerous macrofungi occurred in September at site C2 (Figure 12C), while the monthly average temperature was significantly lower than from June to July. Further analysis of the meteorological data shows that the daily temperature difference at site C2 was significant in September, stimulating macrofungi formation.
Figure 8. Dominant families and genera of six investigation sites from Jilin Province. (A) Dominant families (number of species more than ten of the family) analysis of six investigation sites from Jilin Province. (B) Dominant genera (number of species more than five of the genera) analysis of six investigation sites from Jilin Province. The results show site A1 contains more dominant families and genera in six investigation sites; in contrast, site B2 includes few. A1: Quanshuidong Forest Farm; A2: Lushuihe National Forest Park; B1: Shengli River Forest Farm; B2: Longwan National Forest Park; C1: Zuojia Region; C2: Jingyuetan National Forest Park.

Figure 8. Dominant families and genera of six investigation sites from Jilin Province. (A) Dominant families (number of species more than ten of the family) analysis of six investigation sites from Jilin Province. (B) Dominant genera (number of species more than five of the genera) analysis of six investigation sites from Jilin Province. The results show site A1 contains more dominant families and genera in six investigation sites; in contrast, site B2 includes few. A1: Quanshuidong Forest Farm; A2: Lushuihe National Forest Park; B1: Shengli River Forest Farm; B2: Longwan National Forest Park; C1: Zuojia Region; C2: Jingyuetan National Forest Park.

At last, a canonical correspondence analysis (CCA) was performed on the genera with the top 50% species numbers recorded at the six investigation sites. Five environmental factors—adequate accumulated temperature (AT), monthly mean air temperature from (T), mean humidity (RH), mean precipitation (P), and mean wind speed from July to September (S)—were selected for CCA. The results (Figure 13) showed that all samples were roughly separated into six groups according to their corresponding locations. Eigenvalue axis 1 is higher than axis 2, with cumulative contributions of 32.70% and 28.50%, respectively. The selected environmental factors were found to impact the macrofungi occurrence. Of all the established ecological factors, the mean humidity from July to September, mean precipitation from July to September, and mean wind speed from July to September were the most significant factors.
Figure 9. Relationship between macrofungi occurrence and month in three different investigation sites from Jilin Province. The results showed that they mostly arose from July to September. A1: Quanshuidong Forest Farm; B1: Shengli River Forest Farm; C2: Jingyuetan National Forest Park.

Figure 10. Effect of air humidity on the occurrence of macrofungi in three different investigation sites from Jilin Province. (A) Quanshuidong Forest Farm; (B) Shengli River Forest Farm; (C) Jingyuetan National Forest Park.

Figure 11. Effect of precipitation on the occurrence of macrofungi in three different investigation sites from Jilin Province. (A) Quanshuidong Forest Farm; (B) Shengli River Forest Farm; (C) Jingyuetan National Forest Park.
Figure 11. Effect of precipitation on the occurrence of macrofungi in three different investigation sites from Jilin Province. (A) Quanshuidong Forest Farm; (B) Shengli River Forest Farm; (C) Jingyuetan National Forest Park.

Figure 12. Effect of temperature on the occurrence of macrofungi in three different investigation sites from Jilin Province. (A) Quanshuidong Forest Farm; (B) Shengli River Forest Farm; (C) Jingyuetan National Forest Park.

3.8. Analysis of Flora Diversity

The six investigation sites were divided into three groups: Mt. Changbai area (A), containing Quanshuidong Forest Farm (A1) and Lushuihe National Forest Park (A2); Mt. Changbai Branch (B), comprising the Mt. Longgang Branch (Longwan National Forest Park, B1) and the Mt. Laoyeling Branch (Shengli Forest Farm, B2); and plain low hilly areas (C), encompassing the Zuojia Region (C1) and Jingyuetan National Forest Park (C2). The macrofungi composition was found to change when the mountainous region transitioned to the plains and low hills, and this was determined by calculating the similarity coefficient (s). The similarity decreased from 42.06% to 39.95% (Table 5).

Table 5. Similarity comparison between Mt. Changbai, its branches, and five other investigation sites.

| Location | B    | C    | B1   | B2   | C1   | C2   |
|----------|------|------|------|------|------|------|
| S/%      | 42.06| 39.95| 37.23| 32.39| 26.85| 30.88|

Simultaneously, the macrofungi compositions of Mt. Changbai, its Laoyeling Branch (B1), and the Mt. Longgang Branch (B2) were compared. The similarity between Mt. Changbai and Laoyeling Branch (B1) was 37.23%, higher than the Mt. Longgang Branch.

The top 30 genera were selected to analyze the speciation differences (Figure 14). The composition of site C1 was the most similar to site C2, followed by site B2 and site B1, and site A was the least similar, which was consistent with the results for the similarity coefficient. The similarity of the species composition in Mt. Changbai Branch was lower than that in the plain low hilly area.

Substantial differences were seen in forming distinct genera among the six sites. The number of species in each genus was generally higher for area A and lower for site B2.
Figure 13. Canonical correspondence analysis (CCA) of the selected environmental factors and the recorded macrofungi species. All displayed environmental factors passed the most significant test ($p < 0.05$); P: mean precipitation from July to September; S: mean wind speed from July to September; RH: mean humidity from July to September; A1: Quanshuidong Forest Farm; A2: Lushuihe National Forest Park; B1: Shengli River Forest Farm; B2: Longwan National Forest Park; C1: Zuojia Region; C2: Jingyuetan National Forest Park. Letters are composed of the first three- or four-letter abbreviations of the scientific name, and the corresponding words are provided in Table A2.
3.8. Analysis of Flora Diversity

The six investigation sites were divided into three groups: Mt. Changbai area (A), containing Quanshuidong Forest Farm (A1) and Lushuihe National Forest Park (A2); Mt. Changbai Branch (B), comprising the Mt. Longgang Branch (Longwan National Forest Park, B1) and the Mt. Laoyeling Branch (Shengli Forest Farm, B2); and plain low hilly areas (C), encompassing the Zuojia Region (C1) and Jingyuetan National Forest Park (C2). The macrofungi composition was found to change when the mountainous region transitioned to the plains and low hills, and this was determined by calculating the similarity coefficient (s). The similarity decreased from 42.06% to 39.95% (Table 5).

Simultaneously, the macrofungi compositions of Mt. Changbai, its Laoyeling Branch (B1), and the Mt. Longgang Branch (B2) were compared. The similarity between Mt. Changbai and Laoyeling Branch (B1) was 37.23%, higher than the Mt. Longgang Branch. The top 30 genera were selected to analyze the speciation differences (Figure 14). The composition of site C1 was the most similar to site C2, followed by site B2 and site B1, and site A was the least similar, which was consistent with the results for the similarity coefficient. The similarity of the species composition in Mt. Changbai Branch was lower than that in the plain low hilly area.

Substantial differences were seen in forming distinct genera among the six sites. The number of species in each genus was generally higher for area A and lower for site B2.

Table 5. Similarity comparison between Mt. Changbai, its branches, and five other investigation sites.

| Location | B    | C    | B1   | B2   | C1   | C2   |
|----------|------|------|------|------|------|------|
| S/%      | 42.06| 39.95| 37.23| 32.39| 26.85| 30.88|

Figure 14. Complex heatmap of the macrofungi composition (genus level) at six investigation sites from Jilin Province. A1: Quanshuidong Forest Farm; A2: Lushuihe National Forest Park; B1: Shengli River Forest Farm; B2: Longwan National Forest Park; C1: Zuojia Region; C2: Jingyuetan National Forest Park.

4. Discussion

4.1. The Influence of Environmental Factors on Macrofungi Occurrence

CCA at the genus level of recorded macrofungi at six investigation sites showed that the mean humidity, mean precipitation, and mean wind speed from July to September were the most significant environmental factors influencing the occurrence and distribution of macrofungi.

The effect of wind speed on macrofungi is integrated and multifaceted. The most direct impact is an expansion of the dispersal of the spores range, promoting species dispersal and affecting the macrofungi’s community structure by promoting the formation of dominant populations and reducing the macrofungi species richness within the same plant community [48]. Wind speed will also affect the oxygen content of the plant–macrofungi community. The high oxygen content will influence the oxygen content of soil [49], thus promoting hyphae respiration—the more energy released, the more promotion of mycelium growth [50]. Oxygen content will also affect the fruiting body morphogenesis, and elevated carbon dioxide will result in the formation of deformed mushrooms, thus affecting the macrofungi growth (e.g., the height of fruiting bodies lower than average) [51,52]. Wind speed will also affect soil moisture and air humidity [53]. From a positive perspective, water evaporation and transpiration will increase air humidity and adjust soil and air temperature, which benefits fruiting body formation. However, if the soil moisture evaporates excessively during spore germination and vegetative hyphal growth, excessive evaporation of the soil moisture will inhibit spore germination and promote hyphal reproductive growth or dormancy [54–56]. Furthermore, soil dryness caused by high winds may be a reason that macrofungi become gasteroid.
Precipitation will increase the soil water content, enabling resting spores to obtain sufficient water levels. For spores with thick walls, water immersion is essential. Sufficient soaking softens the walls, triggering enzymes hydrolysis of the spore’s peptidoglycan cortex, enabling the mycelium to germinate more efficiently [57]. Water immersion will also dissolve the substances that inhibit spore germination into the water and release dormancy [58]. Furthermore, water can promote spore respiration and sugar decomposition, provide energy for growth activities, and stimulate spores to secrete various enzymes to destroy cell wall structures [59]. With the gradual temperature increase, the spores were found to absorb enough water to germinate gradually. The suitable temperature and humidity conditions were sufficient for the mycelium to grow in large quantities, laying the foundations for macrofungi occurrence [60,61]. However, this phenomenon depends on vital mechanisms of the spore, for dead spores do not swell, and absorption varies with the viability of the spore [62]. The swelling of spores is usually more than twice its original size [63], and with further germination, the protoplasm volume can sometimes increase more than ten times.

Relative humidity mainly affects the dispersal of spores. If the air humidity is too high, the weight/volume will also increase, thus reducing the dispersal range of spores [64]. The evidence shows that the RH had no direct influence on the growth of macrofungi [53]. If water is available on the surface, macrofungi may grow at deficient air humidity levels [65,66]. RH also influence the growth of mycelia. Excessively high RH would slow down or inhibit mycelium growth [67].

Mushrooms also arise from primordia that their formation and differentiation are influenced by environmental factors such as precipitation and temperature. From 1993 to 2007, Krebs et al. [68] found that mushroom production could be predicted by summer rainfall, in Yukon, the mushroom production is positively correlated with precipitation. Low humidity will slow down the growth rate during primordia formation [69]. The temperature is also another critical factor. The formation of some mushroom’s primordia requires low-temperature stimulation, such as *Flammulina filiformis* (Z.W. Ge, X.B. Liu, and Zhu L. Yang) P.M. Wang, Y.C. Dai, E. Horak, and Zhu L. Yang. The diverse climate types and environments allow different macrofungi to specialize and thrive [70].

**4.2. The Influence of Vegetation on Macrofungi Occurrence**

The Mt. Longgang and Mt. Laoyeling branches both belong to Mt. Changbai. However, the species richness in the Longwan National Forest Park (B2) was found to be higher than that at Mt. Changbai (A) and its Mt. Laoyeling branch (B1). This phenomenon may be due to the differences in their vegetation [71]. Mt. Changbai and its Mt. Laoyeling Branch are mainly covered by coniferous trees, including *Pinus* spp., *Picea* spp., etc. In contrast, Longgang Branch (Longwan National Forest Park, B2) is primarily covered with broadleaf mixed forests, such as *Quercus mongolica* and some pine forests. Macrofungi can show preferences for broadleaf or coniferous trees, vegetation, or substrate specificity might have contributed to the evolution of macrofungi [11,70]. Our result (Figure 6) shows that the typical composition of recorded macrofungi varied in proportion across the six investigation sites. Jelly fungi, for example, at site B2 reached 13%; however, they were only 1–3% at the other investigation sites. Furthermore, deadwood fungi prefer different deadwood characteristics (host species, decay, etc.), and thus, species composition changes can occur about these characteristics [72]. It is evidenced that macrofungi species are usually more abundant in broadleaf forests than in coniferous forests [11]. According to our calculations, the wood and litter saprotroph macrofungi reached 51.7% at site B2, while sites A1, A2, and B1 were 50.3%, 47.9%, and 46.3%, respectively. In addition, plant community composition determines understory light availability, humidity, and litter composition [73]. At the same time, many macrofungal species have host associations with particular plant species; for example, Tuo et al. revealed that the quantity of EM fungi in Wunvfeng National Forest Park, China, was positively correlated with the amount of *Q. mongolica* [6]. Based on our results, site A1 had the highest proportion of EM fungi at
45.78% and site B2 had the lowest at 28.57% among Mt. Changbai and its branch sites. The balance between mycorrhizal macrofungi and saprophytic macrofungi is a reference to forest conditions [74–77]. In a healthy forest, the number of mycorrhizal macrofungi often exceeds the number of saprophytic macrofungi [78,79]. Moreover, the plant community constitutes an abiotic factor of crucial importance for fungal composition [80,81]. However, some studies have demonstrated that the contribution of plant communities to the impact of macrofungi communities is only 1–10% [82]. Therefore, the effects of plant communities on macrofungi require further investigation.

4.3. The Influence of Topography on Macrofungi Occurrence

The ratio of mycorrhizal macrofungi to saprophytic macrofungi decreased with the transition from the eastern mountains to the central plains. Unlike light or soil properties, the topography is an indirect environmental variable [83,84]. Topography is considered an essential driver of micro-habitat diversity in forest ecosystems [85,86], as different topographies result in various micro-habitats. Different micro-habitats can favor the occurrence of a wider variety of macrofungal species [84], thus leading to different macrofungal compositions, which we observed in our results. In our findings, the proportion of macrofungal composition types varied across six survey sites (Figure 6). Moreover, the species numbers for each genus shifted with topography (Figure 14). For example, the Lepiota and Geastrum species were most common at site C2; however, they were considered rare at the other sites. Different macrofungi compositions eventually result in variations in species similarity. Species similarity decreased with the transition from the mountainous area to the plains area in this investigation. Furthermore, the similarity between Mt. Changbai and its Laoyeling Branch (Shengli Forestry Farm, B1) was higher than between Mt. Changbai and the Mt. Longgang branch (Longwan National Forest Park, B2). Based on the comparison of the representative vegetation and soil types of the three areas, the representative forest types and soil types in the Laoyeling Branch and Mt. Changbai area were highly similar, and it is speculated that the occurrence of macrofungi is not only related to vegetation but also closely related to soil types. Soil type influenced spore density and the percentage of mycorrhizal colonization of roots, where high spore density was not necessarily connected with intensive mycorrhizal development [87].

5. Conclusions

The occurrence of macrofungi is closely related to vegetation. By comparing sites B1 and B2, we found that the macrofungal abundance increased with increasing proportions of broadleaf trees, and specific genera were present at every survey site. Moreover, the nutritional patterns of co-occurring genera (species) were analyzed, most of which were saprophytic macrofungi.

The mycorrhizal:saprophytic ratios decreased with the transition from mountains to plains. The mycorrhizal:saprophytic ratios were consistently higher in the northeast than the southwest sites in the Mt. Changbai region and its branches. Species similarity decreased with the transition from the mountainous area to the plains area; in addition, the species similarity between the Laoyeling Branch (B1) and Mt. Changbai (A) is higher than that between the Mt. Longgang Branch (B2) and Mt. Changbai (A).

The main environmental factors affecting macrofungi occurrence from the eastern mountains to the central plains of Jilin Province are the air humidity (RH), precipitation (P), and wind speed (S) from July to September. Our canonical correspondence analysis reveals the importance of wind speed in macrofungal occurrence.
Author Contributions: Conceptualization, Y.L. and B.Z.; experimental design and methodology, Y.L., B.Z., J.-J.H. and Y.-L.T.; performance of practical work, J.-J.H. and G.-P.Z.; statistical analyses, J.-J.H., Y.-L.T., Z.-X.Q. and L.Y.; validation, J.-J.H. and B.Z.; writing—original draft preparation, J.-J.H.; writing—review and editing, B.Z.; supervision, Y.L. and B.Z.; project administration, B.Z.; funding acquisition, B.Z. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest: The authors declare no conflict of interest.


### Appendix A

#### Table A1. Macrofungi list of collected species in three different landforms from Jilin Province.

| Scientific Name                              | Distribution | Nutritional Mode | Economic Value   | Categories | GenBank Accession Number |
|----------------------------------------------|--------------|------------------|------------------|------------|--------------------------|
| Abortiporus biennis (Bull.) Singer           | ✓            | SS               | Medicinal        | PHT fungi  |                          |
| Agaricus abruptibulbus Peck                  | ✓            | SS               | Edible, Poisonous| Agarics    | ON683434                 |
| Agaricus arvensis Schaeff.                   | ✓            | SS               | Edible, Medicinal| Agarics    |                          |
| Agaricus bresadolanus Bohus                  | ✓            | SS               | Edible, Medicinal| Agarics    |                          |
| Agaricus campestris L.                       | ✓            | SS               | Edible, Medicinal| Agarics    |                          |
| Agaricus comtulus Fr.                        | ✓            | SS               | Edible           | Agarics    |                          |
| Agaricus micromegethus Peck                  | ✓            | SS               | Edible, Medicinal| Agarics    |                          |
| Agaricus moelleri Wasser                     | ✓            | SS               | Edible, Poisonous| Agarics    | ON683435                 |
| Agaricus perrarus Fr.                        | ✓            | SS               | Others           | Agarics    |                          |
| Agaricus purpurrellus F.H. Møller            | ✓            | SS               | Others           | Agarics    |                          |
| Agaricus silvaticus Schaeff.                 | ✓            | SS               | Edible, Medicinal| Agarics    |                          |
| Agaricus silvicola-similis Bohus and Locsmándi| ✓            | SS               | Edible           | Agarics    |                          |
| Agaricus subrufescens Peck                   | ✓            | SS               | Edible, Medicinal| Agarics    |                          |
| Agaricus subrutilescens (Kauffman) Hotson and| ✓            | SS               | Edible, Medicinal| Agarics    |                          |
| D.E. Stuntz                                  | ✓            | SS               | Edible, Medicinal| Agarics    |                          |
| Agaricus sylaticus Schaeff.                  | ✓            | SS               | Edible, Medicinal| Agarics    |                          |
| Agrocybe pediades (Fr.) Fayod                | ✓            | SS               | Edible, Medicinal| Agarics    | ON683416                 |
| Agrocybe praecox (Pers.) Fayod               | ✓            | SS               | Edible           | Agarics    |                          |
| Aleuria aurantia (Pers.) Fückel              | ✓            | SS               | Edible, Medicinal| Agarics    |                          |
| Aleurodiscus stereoides Yasuda               | ✓            | SS               | Edible           | Agarics    | ON683421                 |
| Amanita ceciliae (Berk. and Broome) Bas      | ✓            | SS               | Others           | PHT fungi  |                          |
| Amanita fulva Fr.                            | ✓            | SS               | Others           | PHT fungi  |                          |
| Amanita hemibapha (Berk. and Broome) Sacc.   | ✓            | SS               | Others           | PHT fungi  |                          |
| Amanita imazekii T. Oda, C. Tanaka and Tsuda| ✓            | SS               | Edible, Medicinal| Agarics    |                          |
| Amanita longistriata S. Imai                 | ✓            | SS               | Poisonous        | Agarics    |                          |
| Amanita nivalis Grev.                         | ✓            | SS               | Edible           | Agarics    |                          |
| Amanita pantherina (DC.) Krombh               | ✓            | SS               | Poisonous        | Agarics    |                          |
| Amanita phalloides (Vaill. ex Fr.) Link      | ✓            | SS               | Others           | Agarics    | ON683436                 |
| Amanita porphyria Alb. and Schwein.          | ✓            | SS               | Others           | Agarics    | ON683437                 |
| Amanita spreta (Peck) Sacc.                  | ✓            | SS               | Others           | Agarics    |                          |
| Scientific Name                          | Distribution | Nutritional Mode | Economic Value                        | Categories | GenBank Accession Number |
|-----------------------------------------|--------------|------------------|---------------------------------------|------------|--------------------------|
| Amanita subjunquillea S. Imai           | √            |                  | EM Poisonous                          | Agarics    | ON683438                 |
| Amanita vaginata (Bull.) Lam.            | √            |                  | EM Edible, Medicinal, Poisonous      | Agarics    | ON683439                 |
| Amanita virosa Secr.                    | √            |                  | EM                      |            |                          |
| Amanitopsis fulva (Fr.) W.G. Sm.        |               |                  | EM                      |            |                          |
| Ampulloclitocybe clavipes (Pers.) Redhead, Lutzoni, Moncalvo and Vilgalys | √ √ √ √ ✔    |                  | EM                      |            |                          |
| A. cepistipes Velen.                    | √            |                  | EM                      |            |                          |
| A. gallica Marxm. and Romagn.           | √            |                  | EM                      |            |                          |
| A. mellea (Vahl) P. Kumm.               | √ √ √ √       |                  | EM                      |            |                          |
| A. ostoae (Romagn.) Herink              | √            |                  | EM                      |            |                          |
| A. sinapina Bérbé and Dessur.          | √            |                  | EM                      |            |                          |
| A. mellea (Vahl) P. Karst.              | √ √ √ √       |                  | EM                      |            |                          |
| Artomyces pyxidatus (Pers.) Jülich      | √ √ √ √       |                  | EM                      |            |                          |
| Ascocoryne cylichnium (Tul.) Korf       |               |                  | EM                      |            |                          |
| Astraeus hygrometricus (Pers.) Morgan   | √            |                  | EM                      |            |                          |
| Atheniella adonis (Bull.) Redhead, Moncalvo, Vilgalys, Desjardin, and B.A. Perry |               |                  | EM                      |            |                          |
| Auricularia corna Ehrenb.               | √            |                  | EM                      |            |                          |
| Auricularia hepatica F. Wu, B.K. Cui, and Y.C. Dai | √ √ √ √       |                  | EM                      |            |                          |
| Auricularia mesenterica (Dicks.) Pers.  | √            |                  | EM                      |            |                          |
| Auricularia nigricans (Sw.) Birkebak, Looney and Sánchez-Garcia | √ √ √ √ |                  | EM                      |            |                          |
| Auriscalpium vulgare Gray                |               |                  | EM                      |            |                          |
| Baeospora myriacrylifila (Peck) Singer  |               |                  | EM                      |            |                          |
| Bizoprella sulfurina (Quél.) S.E. Carp. | √            |                  | EM                      |            |                          |
| Bjerckandra adusta (Willd.) P. Karst.   | √            |                  | EM                      |            |                          |
| Scientific Name | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|----------------|--------------|------------------|----------------|-----------|-------------------------|
| **Table A1. Cont.** |             |                  |                |           |                         |
| **Scientific Name** | **Distribution** | **Nutritional Mode** | **Economic Value** | **Categories** | **GenBank Accession Number** |
| Bolbitius vitellinus (Pers.) Fr. | √ | SS | Others | Agarics |                         |
| Bolbitius vitellinus (Pers.) Fr. | √ | √ | SS | Others | Boletes |
| Boletinellus meruloides (Schwein.) Murrill | √ | EM | Others | Boletes |                         |
| Boletus edulis Bull. | √ | EM | Edible | Boletes |                         |
| Boletus subvelutipes Peck | √ | EM | Others | Boletes |                         |
| Boletus yunnanensis W.F. Chiu | √ | EM | Poisonous | Boletes |                         |
| Bovista pusilla (Batsch) Pers. | √ | SS | Others | Gasteroid fungi |                         |
| Bovista pusilliformis (Kreisel) Kreisel | √ | SS | Others | Gasteroid fungi |                         |
| **Bulgaria inquinans** (Pers.) Fr. | √ | WS | Edible, Medicinal | Larger Ascomycetes |                         |
| Byssomerulius corium (Pers.) Parmasto | √ | WS | Others | PHT fungi |                         |
| Calocera cornea (Batsch) Fr. | √ | WS | Others | Jelly fungi |                         |
| Calocera viscosa (Pers.) Fr. | √ | WS | Medicinal, Poisonous | Jelly fungi |                         |
| Calocybe gambosa (Fr.) Donk | √ | SS | Edible, Medicinal | Agarics |                         |
| Calocybe ionides (Bull.) Donk | √ | SS | Edible | Agarics |                         |
| Calothecia craniiformis (Schwein.) Fr. ex De Toni | √ | SS | Edible, Medicinal | Gasteroid fungi |                         |
| Calothecia lilacinia (Mont. and Berk.) Henn. | √ | SS | Edible, Medicinal | Gasteroid fungi |                         |
| Calothecia tatransis Hollös | √ | SS | Medicinal | Gasteroid fungi |                         |
| Camarophyllus pratensis (Pers.) P. Kumm. | √ | SS | Others | Agarics |                         |
| Campanella tristis (G. Stev.) Segedin | √ | WS | Others | Agarics |                         |
| Cantharellus cibarius Fr. | √ | EM | Edible, Medicinal | Cantharellloid fungi | ON683495 |
| Cantharellus minor Peck | √ | EM | Edible, Medicinal | Cantharellloid fungi |                         |
| Ceriporia squamosus (Huds.) Quél. | √ | WS | Medicinal | PHT fungi |                         |
| Ceriporia varius (Pers.) Zmitr. and Kovalenko | √ | WS | Edible | PHT fungi |                         |
| Ceriporia tarda (Berk.) Ginns | √ | WS | Others | PHT fungi |                         |
| Chelilymenia coprinaria (Cooke) Boud. | √ | WS | Others | Ascomycetes |                         |
| Chlorociboria aeruginascens (Nyl.) Kanouse | √ | WS | Others | Ascomycetes |                         |
Table A1. Cont.

| Scientific Name | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|-----------------|--------------|------------------|----------------|------------|--------------------------|
|                  | A1 | A2 | B1 | B2 | C1 | C2 |                      |                          |                          |
| Chroogomphus purpurascens (Lj.N. Vassiljeva) | M.M. Nazarova | √ | √ |              | EM | Edible | Boletes |
| Chroogomphus roseolus Y.C. Li and Zhu L. Yang | (Schaeff.) O.K. Mill. | √ | √ | √ | EM | Edible, Medicinal | Boletes |
| Chroogomphus tomentosus (Murrill) O.K. Mill. | Chrysomphalina aurantiaca (Peek) Redhead | √ | √ | √ | EM | Edible, Medicinal | Boletes |
| Chroogomphus roseoatrum (Schaeff.) O.K. Mill. | √ | √ | √ | EM | Edible, Medicinal | Boletes |
| Clavaria fragilis Holmsk. | (Schaeff.) Quél. | √ | √ | √ | LS | Edible, Medicinal | Agarics |
| Clavaria vermicularis Sw. | Clavariadelphus pistillaris (L.) Donk | √ | √ | √ | LS | Edible, Poisonous | Coral fungi |
| Clavicipita pyxidata (Pers.) Doty | Clavulinopsis fusiformis (Sowerby) Corner | √ | √ | √ | LS | Edible | Coral fungi |
| Clavulinopsis corniculata (Schaeff.) Corner | Clavulinopsis helvolus (Pers.) Corner | √ | √ | √ | LS | Edible | Coral fungi |
| Clavulinopsis coralloides (L.) J. Schröt. | Clitocybe nebularis (Batsch) P. Kumm. | √ | √ | √ | LS | Edible, Medicinal | Agarics |
| Clitocybe odora (Bull.) P. Kumm. | Clitocybe phyllophila (Pers.) P. Kumm. | √ | √ | √ | LS | Edible | Agarics |
| Clitocybe phyllophila (Pers.) P. Kumm. | Clitocybe phyllophila (Pers.) P. Kumm. | √ | √ | √ | LS | Edible | Agarics |
| Collybia nivea (Mont.) Dennis | Collybia nivea (Mont.) Dennis | √ | √ | √ | SS | Edible | Agarics |
| Collybiopsis confluens (Pers.) R.H. Petersen | Collybiopsis confluens (Pers.) R.H. Petersen | √ | √ | √ | SS | Edible | Agarics |
| Collybiopsis peronata (Bolton) R.H. Petersen | Collybiopsis peronata (Bolton) R.H. Petersen | √ | √ | √ | SS | Edible | Agarics |
| Coltricia cinnamomea (Jacq.) Murrill | Coltricia cinnamomea (Jacq.) Murrill | √ | √ | √ | SS | Edible | PHT fungi |
| Coltricia perennis (L.) Murrill | Connoporus acervatus (Fr.) K.W. Hughes, Mather and R.H. Petersen | √ | √ | √ | SS | Edible | Agarics |
| Connoporus acervatus (Fr.) K.W. Hughes, Mather and R.H. Petersen | Connoporus lacteum (J.E. Lange) Métrod | √ | √ | √ | SS | Medicinal | Agarics |
| Conocybe tenera (Schaeff.) Kühner | Conocybe tenera (Schaeff.) Kühner | √ | √ | √ | SS | Poisonous | Agarics |
| Coprinellus disseminatus (Pers.) J.E. Lange | Coprinus atramentaria (Bull.) Redhead, Vilgalys, Hopple and Jacq. Johnson | √ | √ | √ | SS | Edible, Medicinal, Poisonous | Agarics |
| Coprinus atramentaria (Bull.) Redhead, Vilgalys and Moncalvo | √ | √ | √ | SS | Edible, Medicinal, Poisonous | Agarics |
| Scientific Name | Distribution | Nutritional Mode | Economic Value Categories | GenBank Accession Number |
|----------------|--------------|------------------|---------------------------|-------------------------|
| Coprinopsis cinerea (Schaeff.) Redhead, Vilgalys and Moncalvo | A1 A2 B1 B2 C1 C2 | SS | Medicinal | Agarics |
| Coprinopsis insignis (Peck) Redhead, Vilgalys & Moncalvo | √ | SS | Medicinal | Agarics |
| Coprinopsis lagopus (Fr.) Redhead, Vilgalys and Moncalvo | √ | SS | Medicinal | Agarics |
| Coprinopsis picacea (Bull.) Redhead, Vilgalys and Moncalvo | √ | SS | Poisonous | Agarics |
| Coprinus comatus (O.F. Müll.) Pers. | √ A1 A2 B1 B2 C1 C2 | DS | Edible, Medicinal, Poisonous | Agarics |
| Coprinus micaceus (Bull.) Fr. | √ | DS | Medicinal, Poisonous | Agarics |
| Coprinus plicatilis (Curtis) Fr. | √ | DS | Others | Agarics |
| Coprinus sterquilinus (Fr.) Fr. | √ | DS | Medicinal | Agarics |
| Cordyceps farinosa (Holmsk.) Kepler, B. Shrestha and Spatafora | √ | EI | Others | Larger Ascomycetes |
| Cordyceps militaris (L.) Fr. | √ A1 A2 B1 B2 C1 C2 | EI | Edible, Medicinal | Larger Ascomycetes |
| Cordyceps nutans Pat. | √ | EI | Others | Larger Ascomycetes |
| Cordylopsis gallica (Fr.) Ryvarden | √ | WS | Others | PHT fungi |
| Cortinarius albobilaceus (Pers.) Fr. | √ | EM | Edible | Agarics |
| Cortinarius armillatus (Fr.) Fr. | √ | EM | Others | Agarics |
| Cortinarius bovinus Fr. | √ | EM | Edible, Medicinal | Agarics |
| Cortinarius caerulescens (Schaeff.) Fr. | √ | EM | Others | Agarics |
| Cortinarius callochrous (Pers.) Gray | √ | EM | Edible, Poisonous | Agarics |
| Cortinarius caperatus (Pers.) Fr. | √ | EM | Edible, Medicinal | Agarics |
| Cortinarius cinamomeus (L.) Gray | √ | EM | Poisonous | Agarics |
| Cortinarius collinitus (Sowerby) Gray | √ | EM | Edible, Medicinal | Agarics |
| Cortinarius colymbacinus Fr. | √ | EM | Others | Agarics |
| Cortinarius elator Fr. | √ | EM | Others | Agarics |
| Cortinarius galeroides Hongo | √ | EM | Others | Agarics |
| Scientific Name                                                                 | Distribution | Nutritional Mode | Economic Value   | Categories               | GenBank Accession Number |
|---------------------------------------------------------------------------------|--------------|------------------|------------------|--------------------------|--------------------------|
| **A1** A2 B1 B2 C1 C2                                                          |              |                  |                  |                          |                          |
| **Cortinarius lilacinus** Peck                                                   |              |                  | EM               | Poisonous                |                          |
| **Cortinarius longipes** Peck                                                    |              |                  | EM               | Others                  |                          |
| **Cortinarius multiformis** Fr.                                                 | √            |                  | EM               | Edible                  |                          |
| **Cortinarius orellanus** Fr.                                                   |              |                  | EM               | Poisonous                |                          |
| **Cortinarius purpurascens** Fr.                                                |              |                  | EM               | Edible                  |                          |
| **Cortinarius sanguineus** (Wulfen) Gray                                       |              |                  | EM               | Medicinal, Poisonous    |                          |
| **Cortinarius trivialis** J.E. Lange                                            |              |                  | EM               | Poisonous                |                          |
| **Cotylidia diaphana** (Cooke) Lentz                                            |              |                  | LS               | Others                  | PHT fungi                |
| **Cotylidia komabensis** (Henn.) D.A. Reid                                     |              |                  | LS               | Others                  | PHT fungi                |
| **Craterellus undulatus** (Pers.) E. Campo and Papetti                          |              |                  | WS               | Others                  |                          |
| **Crepidotus applanatus** (P.) Kumm.                                            |              |                  | WS               | Others                  |                          |
| **Crepidotus badiofoccosus** S. Imai                                           |              |                  | WS               | Others                  |                          |
| **Crepidotus betulae** Murrill                                                  |              |                  | WS               | Others                  |                          |
| **Crepidotus brasilienensis** Rick                                              |              |                  | WS               | Medicinal                |                          |
| **Crepidotus epiphyus** (Fr.) Qué.                                              |              |                  | WS               | Others                  |                          |
| **Crepidotus fulvomentosus** (Peck) Peck                                        |              |                  | WS               | Others                  |                          |
| **Crepidotus herbarum** Sacc.                                                   |              |                  | WS               | Others                  |                          |
| **Crepidotus mollis** (Schaeff.) Staude                                         |              |                  | WS               | Others                  |                          |
| **Crepidotus nephrode** (Berk. and M.A. Curtis) Sacc.                           |              |                  | WS               | Others                  |                          |
| **Crepidotus nephrodes** (Berk. and M.A. Curtis) Sacc.                          |              |                  | WS               | Others                  |                          |
| **Crepidotus palmularis** (Berk. and M.A. Curtis) Sacc.                         |              |                  | WS               | Others                  |                          |
| **Crepidotus sulphurinus** Imazeki and Toki                                     |              |                  | WS               | Others                  |                          |
| **Crepidotus variabilis** (Pers.) P. Kumm.                                     |              |                  | WS               | Others                  |                          |
| **Cryphellum stipitaria** (Fr.) Pat.                                            |              |                  | LS               | Others                  |                          |
| **Cuphophyllus pratensis** (Pers.) Bon                                          |              |                  | SS               | Edible                  | Agarics                  |
| **Cuphophyllus virgineus** (Wulfen) Kovalenko                                  |              |                  | SS               | Others                  | Agarics                  |
| **Cyathus sacerdus** (Schwein.) De Toni                                        |              |                  | WS               | Medicinal                | Gasteroid fungi           |
| **Cyathus striatus** Willd.                                                     |              |                  | WS               | Medicinal                | Gasteroid fungi           |
| **Cyclocebe cylindracea** (DC.) Vizzini and Angelini                            |              |                  | SS               | Edible, Medicinal        | Agarics                  |
| Scientific Name                                                                 | Distribution | Nutritional Mode | Economic Value | Categories                          | GenBank Accession Number |
|--------------------------------------------------------------------------------|--------------|------------------|----------------|-------------------------------------|--------------------------|
| **Table A1. Cont.**                                                             |              |                  |                |                                     |                          |
| *Cyclocybe erebia* (Fr.) Vizzini and Matheny                                    |              |                  |                |                                     |                          |
| *Cystoderma amianthinum* (Scop.) Fayod                                           | ✓            |                  | SS            | Edible, Medicinal                   |                          |
| *Cystoderma fallax* A.H. Sm. and Singer                                         | ✓            |                  | SS            | Edible                             |                          |
| *Cystodermella granulosa* (Batsch) Harmaja                                      |              |                  | SS            | Edible                             |                          |
| *Dacrymyces chrysospermus* Berk. and M.A. Curtis                                | ✓            |                  | WS            | Others                             |                          |
| *Dacrymyces palmatus* Bres.                                                     |              |                  | WS            | Others                             |                          |
| *Dacryopinax spathularia* (Schwein.) G.W. Martin                                | ✓            |                  | WS            | Others                             |                          |
| *Daedalea dickinsii* Yasuda                                                     | ✓            |                  | WS            | Medicinal                          |                          |
| *Daedaleopsis confragosa* (Bolton) J. Schröt.                                   | ✓            |                  | WS            | Medicinal                          |                          |
| *Daedaleopsis tricolor* (Bull.) Bondartsev and Singer                           | ✓            |                  | WS            | Medicinal                          |                          |
| *Daldinia concentrica* (Bolton) Ces. and De Not.                                | ✓            |                  | WS            | Medicinal                          |                          |
| *Daldinia grandis* Child                                                        | ✓            |                  | WS            | Others                             |                          |
| *Deconica coprophila* (Bull.) P. Karst.                                         |              |                  | DS            | Poisonous                          |                          |
| *Deconica merdaria* (Fr.) Noordel.                                              |              |                  | DS            | Poisonous                          |                          |
| *Desarmillaria tabescens* (Scop.) R.A. Koch and Aime                           |              |                  | SS            | Edible, Medicinal, Poisonous        |                          |
| *Descolea flavoannulata* (Lj.N. Vassiljeva) E. Horak                           |              |                  | SS            | Edible                             |                          |
| *Dumontinia tuberosa* (Bull.) L.M. Kohn                                        | ✓            |                  | SS            | Others                             |                          |
| *Entoloma abortivum* (Berk. and M.A. Curtis) Donk                                | ✓            |                  | SS            | Edible, Medicinal                   |                          |
| *Entoloma albipes* Hesler                                                       | ✓            |                  | SS            | Others                             |                          |
| *Entoloma chamaecyparidis* (Hongo) Hongo                                        |              |                  | SS            | Others                             |                          |
| *Entoloma elypeatum* (L.) P. Kumm.                                             | ✓            |                  | SS            | Medicinal                           |                          |
| *Entoloma japonicum* (Hongo) Hongo and Izawa                                    |              |                  | SS            | Others                             |                          |
| *Entoloma lividum* Quel.                                                        |              |                  | SS            | Others                             |                          |
| *Entoloma murrinipes* (Murrill) Hesler                                          | ✓            |                  | SS            | Others                             |                          |
| *Entoloma murrillii* Hesler                                                     | ✓            |                  | SS            | Others                             |                          |
| *Entoloma politum* (Pers.) Noordel.                                             |              |                  | SS            | Others                             |                          |
Table A1. Cont.

| Scientific Name                          | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|------------------------------------------|--------------|------------------|----------------|------------|--------------------------|
| Entoloma rhodopolium (Fr.) P. Kumm.     | ✓            | ✓                | ✓             | SS         | Medicinal, Poisonous     |                      |
| Entoloma sinuatum (Bull.) P. Kumm.       | ✓            |                  | ✓             | SS         | Medicinal, Poisonous     |                      |
| Entoloma speculatum (Fr.) Quél.          | ✓            |                  |               | SS         | Others                   | Agarics              |
| Entoloma umbilicatum Dennis              | ✓            |                  | ✓             | SS         | Others                   | Agarics              |
| Entoloma liquescent Möller               | ✓            |                  |               | WS         | Others                   | Agarics              |
| Exidia glandulosa (Bull.) Fr.            | ✓            |                  |               | WS         | Edible, Poisonous        | Jelly fungi          |
| Flammulaster erinaceellus (Peck) Watling | ✓            |                  |               | WS         | Others                   | Agarics              |
| Flammulina filiformis (Z.W. Ge, X.B. Liu, and Zhu L. Yang) P.M. Wang, Y.C. Dai, E. Horak, and Zhu L. Yang | ✓            |                  |               | WS         | Edible                   | Agarics              |
| Fomes fomentarius (L.) Fr.               | ✓            |                  |               | WS         | Medicinal                | PHT fungi            |
| Fomitopsis betulina (Bull.) B.K. Cui, M.L. Han, and Y.C. Dai | ✓            |                  |               | WS         | Medicinal                | PHT fungi            |
| Fomitopsis officinalis (Vill.) Bondartsev and Singer | ✓            |                  |               | WS         | Medicinal                | PHT fungi            |
| Galerina helvoliceps (Berk. and M.A. Curtis) Singer | ✓            |                  |               | WS         | Poisonous                | PHT fungi            |
| Galerina margnata (Batsch) Kühner        | ✓            |                  |               | SS         | Poisonous                | PHT fungi            |
| Galerina vittaeformis (Fr.) Singer       | ✓            |                  |               | SS         | Others                   | Agarics              |
| Galerina amurensis (Lj.N. Vassiljeva) Raitv. | ✓            |                  |               | SS         | Others                   | Larger Ascomycetes   |
| Ganoderma applanatum (Pers.) Pat.        | ✓            |                  |               | WS         | Medicinal                | PHT fungi            |
| Ganoderma tsugae Murrill                 | ✓            |                  |               | WS         | Medicinal                | PHT fungi            |
| Geastrum fimbriatum Fr.                  | ✓            |                  |               | LS         | Medicinal                | Gasteroid fungi      |
| Geastrum pectinatum Pers.                | ✓            |                  |               | LS         | Others                   | Gasteroid fungi      |
| Geastrum saccatum Fr.                    | ✓            |                  |               | LS         | Medicinal                | Gasteroid fungi      |
| Geastrum triplex Jungh.                  | ✓            |                  |               | LS         | Medicinal                | Gasteroid fungi      |
| Geronema albidaum (Fr.) Singer           | ✓            |                  |               | SS         | Edible                   | Agarics              |
| Gloiophorus psittacinu (Schaeff.) Herink | ✓            |                  |               | SS         | Edible, Poisonous        | Agarics              |
| Gloeophyllum septarium (Wulfen) P. Karst. | ✓            |                  |               | WS         | Medicinal                | PHT fungi            |
| Scientific Name                                           | Distribution | Nutritional Mode | Economic Value | Categories       | GenBank Accession Number |
|-----------------------------------------------------------|--------------|------------------|----------------|------------------|--------------------------|
| *Gloeophyllum subferrugineum* (Berk.) Bondartsev and Singer | √            | √                | WS             | Others           | PHT fungi                |
| *Gloeophyllum trabeum* (Pers.) Murrill                    |              |                  | WS             | Medicinal        | PHT fungi                |
| *Gloeostereum incarnatum* S. Ito and S. Imai              | √            | √                | WS             | Edible, Medicinal| PHT fungi                |
| *Gomphidius maculatus* (Scop.) Fr.                        | √            |                  | EM             | Edible           | Boletes                  |
| *Gomphus clavatus* (Pers.) Gray                           |              |                  | EM             | Edible, Medicinal| Cantharelloid fungi       |
| *Guepinia helvelloides* (DC.) Fr.                         | √            |                  | SS             | Edible           | Jelly fungi              |
| *Gymnopilus aeruginosus* (Peck) Singer                    | √            |                  | WS             | Others           | Agarics                  |
| *Gymnopilus flavonius* (Fr.) P.D. Orton                    | √            |                  | WS             | Others           | Agarics                  |
| *Gymnopilus liquiritiae* (Pers.) P. Karst                 |              |                  | WS             | Medicinal, Poisonous| Agarics                |
| *Gymnopilus penetrans* (Fr.) Murrill                      | √            |                  | WS             | Poisonous        | Agarics                  |
| *Gymnopilus dryophilus* (Bull.) Murrill                   | √            |                  | LS             | Others           | Agarics                  |
| *Gymnopus erythropus* (Pers.) Antonin, Halling and Noordel.|              |                  | LS             | Edible           | Agarics                  |
| *Gymnopus fusipes* (Bull.) Gray                           | √            |                  | LS             | Edible           | Agarics                  |
| *Gymnopus oclor* (Pers.) Antonin and Noordel.             | √            |                  | LS             | Edible           | Agarics                  |
| *Gymnopus polyphyllus* (Peck) Halling                     | √            |                  | LS             | Others           | Agarics                  |
| *Harrya chromipes* (Frost) Halling, Nuhn, Osmundson and Manfr. Binder |              |                  | EM             | Others           | Boletes                  |
| *Helbeloma hiemalis* Bres.                                |              |                  | SS             | Others           | Agarics                  |
| *Helbeloma radicosum* (Bull.) Ricken                      |              |                  | SS             | Edible, Poisonous| Agarics                  |
| *Helvellaatra* J. König                                  |              |                  | SS             | Edible           | Larger                   |
| *Helvella crispa* (Scop.) Fr.                             | √            |                  | SS             | Edible, Poisonous| Larger                   |
| *Helvella elastica* Bull.                                 |              |                  | SS             | Edible           | Larger                   |
| Scientific Name                                                                 | Distribution | Nutritional Mode | Economic Value | Categories          | GenBank Accession Number |
|--------------------------------------------------------------------------------|--------------|------------------|----------------|---------------------|--------------------------|
| *Helvella ephippium* Lévé                                                 | ✓ ✓          | SS               | Edible         | Larger              |                          |
| *Helvella lacunosa* Afzel.                                                | ✓            | SS               | Edible, Medicinal | Ascomycetes         |                          |
| *Hemistropharia albocrenulata* (Peck) Jacobsson and E. Larss.          | ✓            | WS               | Edible, Poisonous | Agarics             |                          |
| *Hericium coralloides* (Scop.) Pers.                                      | ✓            | WS               | Edible, Medicinal | Larger Ascomycetes |                          |
| *Hericium erinaceus* (Bull.) Pers.                                        | ✓            | WS               | Edible, Medicinal | PHT fungi           | ON683494                |
| *Hohenbuehelia reniformis* (G. Mey.) Singer                                | ✓ ✓          | SS               | Edible, Medicinal | Agarics             |                          |
| *Hohenbuehelia serotina* (Pers.) Singer                                    | ✓            | WS               | Edible          | Agarics             |                          |
| *Hortiboletus rubellus* (Krombh.) Simonini, Vizzini and Gelardi           | ✓ ✓          | EM               | Edible, Medicinal | Others              |                          |
| *Humaria hemisphaerica* (E.H. Wigg.) Fuckel                                 | ✓ ✓          | SS               | Edible, Medicinal | Larger Ascomycetes |                          |
| *Hydnum repandum* L.                                                       | ✓ ✓ ✓ ✓       | EM               | Edible, Medicinal | PHT fungi           |                          |
| *Hygrocybe ceracea* (Sowerby) P. Kumm.                                    | ✓ ✓          | SS               | Edible          | Agarics             |                          |
| *Hygrocybe chlorophana* (Fr.) Wünsche                                     | ✓            | SS               | Edible          | Agarics             |                          |
| *Hygrocybe coccinea* (Schaeff.) P. Kumm.                                  | ✓            | SS               | Edible          | Agarics             |                          |
| *Hygrocybe flavescens* (Kauffman) Singer                                   | ✓ ✓          | SS               | Poisonous       | Agarics             | ON683450                |
| *Hygrocybe marchii* (Bres.) Singer                                        | ✓            | SS               | Others          | Agarics             |                          |
| *Hygrocybe miniata* (Fr.) P. Kumm.                                       | ✓ ✓          | SS               | Edible          | Agarics             |                          |
| *Hygrocybe chrysodon* (Batsch) Fr.                                        | ✓ ✓          | SS               | Edible          | Agarics             |                          |
| *Hygrocybe earumus* (Bull.) Fr.                                           | ✓ ✓          | SS               | Edible          | Agarics             |                          |
| *Hygrophorus laurae Morgan*                                                | ✓ ✓          | SS               | Others          | Agarics             |                          |
| *Hygrophorus lucorum* Kalchbr.                                             | ✓ ✓          | SS               | Edible, Medicinal | Agarics             |                          |
| *Hygrophorus occidentalis* A.H. Sm. and Hesler                             | ✓ ✓          | SS               | Others          | Agarics             |                          |
| *Hygrophorus olivaceo-albus* (Fr.) Fr.                                    | ✓            | SS               | Edible          | Agarics             |                          |
| *Hygrophorus piceae* Kühner                                                | ✓            | SS               | Others          | Agarics             |                          |
| *Hygrophorus pseudochrysaspis* Hesler and A.H. Sm.                         | ✓ ✓          | SS               | Others          | Agarics             |                          |
| Scientific Name | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|-----------------|--------------|------------------|----------------|------------|--------------------------|
| **Hygrophorus russula** (Schaeff. ex Fr.) Kauffman | √ | | SS | Edible | Agarics | ON683451 |
| **Hymenochaete adusta** (Lév.) Har. and Pat. | | | | | | |
| **Hymenochaete corrugata** (Fr.) Lév. | √ | √ | | WS | Others | PHT fungi |
| **Hymenochaete xenantica** (Berk.) S.H. He and Y.C. Dai | | | | | | |
| **Hymenopellis radicata** (Relhan) R.H. Petersen | | | | WS | Others | PHT fungi |
| **Hymenocyphus fructigenus** (Bull.) Gray | | | | WS | Others | Larger |
| **Hypholoma capnoides** (Fr.) P. Kumm. | √ | | WS | Medicinal, Poisonous | Agarics |
| **Hypholoma fasciculare** (Huds.) P. Kumm. | √ | √ | √ | √ | √ | WS | Medicinal, Poisonous | Agarics |
| **Hypholoma lateritium** (Schaeff.) P. Kumm. | | | | WS | Poisonous | Agarics |
| **Hypsiszygus marmoreus** (Peck) H.E. Bigelow | | | | WS | Others | Agarics |
| **Hypsiszygus ulmarius** (Bull.) Redhead | | | | WS | Edible, Medicinal | Agarics |
| **Infundibulicybe geotropa** (Bull.) Harmaja | | | | SS | Poisonous | Agarics |
| **Infundibulicybe gibba** (Pers.) P. Kumm. | √ | √ | √ | √ | √ | LS | Edible | Agarics | ON683453 |
| **Inocybe asterospora** Quél. | | | | EM | Poisonous | Agarics |
| **Inocybe calamistrata** (Fr.) Gillet | | | | EM | Poisonous | Agarics |
| **Inocybe changbaiensis** T. Bau and Y.G. Fan | | | | EM | Others | Agarics |
| **Inocybe cookii** Bres. | | | | EM | Poisonous | Agarics |
| **Inocybe earleana** Kauffma | | | | EM | Others | Agarics |
| **Inocybe eucalyctea** E. Ludw. | | | | EM | Others | Agarics |
| **Inocybe fulvella** Bres. | | | | EM | Others | Agarics |
| **Inocybe geophilus** P. Kumm. | | | | EM | Poisonous | Agarics |
| **Inocybe napipes** J.E. Lange | | | | EM | Poisonous | Agarics |
| **Inocybe praetereisa** Quél. | | | | EM | Poisonous | Agarics |
| **Inocybe subalbidodisca** Stangl and J. Veselsky | | | | EM | Others | Agarics |
| **Inocybe umbrinella** Bres. | | | | EM | Others | Agarics |
| **Inonotus hispidus** (Bull.) P. Karst. | | | | WS | Medicinal | PHT fungi | ON683454 |
| **Inonotus obliquus** (Fr.) Pilát | | | | WS | Medicinal | PHT fungi |
| **Inosperma calamistratum** (Fr.) Matheny and Esteve-Rav. | | | | LS | Others | Agarics |
Table A1. Cont.

| Scientific Name | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|-----------------|--------------|------------------|----------------|------------|-------------------------|
| **Irpex lacteus** (Fr.) Fr. | √ | WS | Others | PHT fungi | ON683455 |
| **Isaria japonica** Yasuda | | EI | Others | Ascomycetes | |
| **Junghuhnia nitida** (Pers.) Ryvarden | √ | WS | Edible | PHT fungi | |
| **Kuehneromyces mutabilis** (Schaeff.) Singer and A.H. Sm. | √, √, √ | WS | Edible | Agarics | ON683456 |
| **Laccaria alba** Zhu L. Yang and Lan Wang | √, √ | EM | Edible | Agarics | ON683457 |
| **Laccaria amethystea** (Bull.) Murrill | √, √, √, √ | EM | Edible, Medicinal | Agarics | ON683458 |
| **Laccaria amethystina** Cooke | √ | EM | Others | Agarics | |
| **Laccaria lactata** (Scop.) Cooke | √, √, √ | EM | Others | Agarics | |
| **Laccaria purpureobadia** D.A. Reid | √ | EM | Others | Agarics | |
| **Laccaria tortilis** (Bolton) Cooke | √ | EM | Edible, Medicinal | Agarics | ON683459 |
| **Lacrymaria lacrymabunda** (Bull.) Pat. | √ | SS | Poisonous | Agarics | |
| **Lactarius acris** (Bolton) Gray | | EM | Others | Agarics | |
| **Lactarius aurantiacus** (Pers.) Gray | √ | EM | Edible, Medicinal | Agarics | |
| **Lactarius camphoratus** (Bull.) Fr. | √, √ | EM | Edible | Agarics | |
| **Lactarius circellatus** Fr. | | EM | Edible | Agarics | |
| **Lactarius deliciosus** (L.) Gray | √, √ | EM | Edible, Medicinal | Agarics | |
| **Lactarius fuliginosus** (Fr.) Fr. | √, √, √, √ | EM | Edible, Medicinal | Agarics | |
| **Lactarius hatsudake** Nobuj. Tanaka | √, √, √ | EM | Edible, Medicinal | Agarics | |
| **Lactarius lignyotus** Fr. | | EM | Others | Agarics | |
| **Lactarius mitissimus** (Fr.) Fr. | √ | EM | Others | Agarics | |
| **Lactarius piperatus** (L.) Pers. | √, √, √, √, √ | EM | Edible, Medicinal, Poisonous | Agarics | |
| **Lactarius subdulcis** (Pers.) Gray | | EM | Edible | Agarics | |
| **Lactarius tetragonus** (Bull.) Gray | √, √, √ | EM | Others | Agarics | |
| **Lactarius formosus** (Schaeff.) Pers. | √, √, √, √ | EM | Poisonous | Agarics | |
| **Lactarius trivialis** (Fr.) Fr. | √, √, √, √ | EM | Edible, Medicinal, Poisonous | Agarics | |
| **Lactarius vellereus** (Fr.) Fr. | √, √, √, √ | EM | Edible | Agarics | |
| **Lactarius vietus** (Fr.) Fr. | √, √, √, √ | EM | Edible | Agarics | |
Table A1. Cont.

| Scientific Name                                      | Distribution | Nutritional Mode | Economic Value | Categories   | GenBank Accession Number |
|------------------------------------------------------|--------------|-----------------|----------------|--------------|--------------------------|
| Lactarius volemus (Fr.) Fr.                          | √            |                 | EM             | Edible, Medicinal | Agarics                  |
| Lactarius zonarius (Bull.) Fr.                       | √            |                 | EM             | Medicinal, Poisonous | Agarics                  |
| Lactifluus subpiperatus (Hongo) Verbeken             | √            |                 | EM             | Others         | Agarics                  |
| Laetiporus crematus Y. Ota and T. Hatt.              | √            |                 |                |               |                          |
| Laetiporus montanus Černý ex Tomšovský and Jankovský | √            |                 |                |               |                          |
| Laetiporus sulphureus (Bull.) Murrill                | √            |                 |                |               |                          |
| Leccinum chromapes (Frost) Singer                    | √            |                 | EM             | Others         | Boletes                  |
| Leccinum scabrum (Bull.) Gray                        | √            |                 | EM             | Edible, Poisonous | Boletes                  |
| Lentinellus flavelliformis (Bolton) S. Ito           | √            |                 | WS             | Others         | Agarics                  |
| Lentinellus ursinus (Fr.) Kühner                     | √            |                 | WS             | Edible         | Agarics                  |
| Lentinula edodes (Berk.) Pegler                      | √            |                 | WS             | Edible, Medicinal | Agarics                  |
| Lentinus arcularius (Batsch) Zmitr.                  | √            |                 | WS             | Medicinal      | PHT fungi                |
| Lentinus brunalis (Pers.) Zmitr.                     | √            |                 | WS             | Edible         | PHT fungi                |
| Lentinus elmeri Bres.                                | √            |                 | WS             | Others         | PHT fungi                |
| Lentinus substrictus (Bolton) Zmitr. and Kovalenko   | √            |                 | WS             | Others         | PHT fungi                |
| Lentinus tigrinus (Bull.) Fr.                        | √            |                 | WS             | Edible, Medicinal | PHT fungi                |
| Lenzites albidà (Fr.) Fr.                            | √            |                 | WS             | Edible         | PHT fungi                |
| Lenzites betulinus (L.) Fr.                          | √            |                 | WS             | Medicinal      | PHT fungi                |
| Lenzites repanda Fr.                                 | √            |                 | WS             | Poisonous      | PHT fungi                |
| Leotia lubrica (Scop.) Pers.                         | √            |                 | SS             | Others         | Larger Ascomycetes       |
| Lepiota brunneoincarnata Chodat and C. Martín       | √            |                 | LS             | Poisonous      | Agarics                  |
| Lepiota castanea Quél.                               | √            |                 | LS             | Poisonous      | Agarics                  |
| Lepiota clypeolaria (Bull.) P. Kumm.                 | √            |                 | LS             | Poisonous      | Agarics                  |
| Lepiota cristata (Bolton) P. Kumm.                   | √            |                 | LS             | Poisonous      | Agarics                  |
| Lepiota erminea (Fr.) P. Kumm.                       | √            |                 | LS             | Edible         | Agarics                  |
| Lepiota felina (Pers.) Karst.                        | √            |                 | LS             | Others         | Agarics                  |
| Lepiota fusiceps Hongo                                | √            |                 | LS             | Others         | Agarics                  |
| Lepiota magnispora Murrill                           | √            |                 | LS             | Others         | Agarics                  |
| Lepista glaucoana (Bres.) Singer                     | √            |                 | LS             | Edible         | Agarics                  |
Table A1. Cont.

| Scientific Name                                      | Distribution | Nutritional Mode | Economic Value                          | Categories | GenBank Accession Number |
|------------------------------------------------------|--------------|------------------|-----------------------------------------|------------|--------------------------|
| Lepista irina (Fr.) H.E. Bigelow                     | √            | LS               | Medicinal, Poisonous                     | Agarics    |                          |
| Lepista nuda (Bull.) Cooke                           | √            | LS               | Edible, Medicinal                        | Agarics    | ON683463                 |
| Lepista personata (Fr.) Cooke                         | √            | LS               | Edible, Medicinal                        | Agarics    |                          |
| Lepista sordida (Schumach.) Singer                   | √            | LS               | Edible, Medicinal                        | Agarics    |                          |
| Leucoagaricus leucothites (Vittad.) Wasser           | √            | SS               | Edible, Medicinal, Poisonous              | Agarics    |                          |
| Leucoagaricus rubrotinctus (Peck) Singer             | √            | SS               | Others                                   | Agarics    | ON683464                 |
| Leucocybe candidans (Pers.) Vizzini, P. Alvarado, G. Moreno, and Consiglio | √            | SS               | Medicinal, Poisonous                      | Agarics    |                          |
| Leucocybe houghtonii (W. Phillips) Halama and Pencak. | √            | SS               | Others                                   | Agarics    |                          |
| Lopharia cinerascens (Schwein.) G. Cunn.             |              | WS               | Others                                   | PHT fungi  |                          |
| Lycoperdon fuscom Huds.                              |              | SS               | Edible, Medicinal Gasteroid fungi        | Gasteroid fungi |                          |
| Lycoperdon mammaeforme Pers.                         | √            | SS               | Others                                   | Gasteroid fungi |                          |
| Lycoperdon pedicellatum Batsch                       | √            | SS               | Edible, Medicinal Gasteroid fungi        | Gasteroid fungi |                          |
| Lycoperdon perlatum Pers.                            | √            | SS               | Others                                   | Gasteroid fungi |                          |
| Lycoperdon pusillum Hedw.                            | √            | SS               | Edible, Medicinal Gasteroid fungi        | Gasteroid fungi |                          |
| Lycoperdon pyriforme Schaeff.                        | √            | SS               | Others                                   | Gasteroid fungi |                          |
| Lycoperdon umbrinum Pers.                            | √            | SS               | Edible, Medicinal Gasteroid fungi        | Gasteroid fungi |                          |
| Lycophyllum decastes (Fr.) Singer                    | √            | EM               | Edible, Medicinal                         | Agarics    | ON683465                 |
| Lysurus mokusin (L.) Fr.                             |              | SS               | Medicinal                                | Gasteroid fungi |                          |
| Macrolepiota procera (Scop.) Singer                  |              | SS               | Others                                   | Agarics    |                          |
| Marasmiellus candidus (Fr.) Singer                   |              | SS               | Edible                                   | Agarics    |                          |
| Marasmiellus eburneus (Theiss.) Singer               | √            | WS               | Others                                   | Agarics    |                          |
| Marasmiellus ramealis (Bull.) Singer                 | √            | WS               | Medicinal                                | Agarics    |                          |
| Marasmiurus aurantiacus I. Hino                      |              | LS               | Edible, Medicinal                         | Agarics    |                          |
| Scientific Name                                                                 | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|--------------------------------------------------------------------------------|--------------|------------------|----------------|------------|--------------------------|
| Marasmius beniensis Singer                                                    | √            | LS               | Others         | Agarics    |                          |
| Marasmius chordalis Fr.                                                        | √            | LS               | Others         | Agarics    |                          |
| Marasmius cohaerens (Pers.) Cooke and Quél.                                    | √            | LS               | Others         | Agarics    |                          |
| Marasmius epiphyllus (Pers.) Fr.                                               | √            | LS               | Others         | Agarics    |                          |
| Marasmius floriceps Berk. and M.A. Curtis                                      | √            | LS               | Others         | Agarics    |                          |
| Marasmius maximus Hongo                                                        | √            | LS               | Edible         | Agarics    | ON683427                 |
| Marasmius occultatiformis Antonín, Ryoo, and H.D. Shin                         | √            | LS               | Others         | Agarics    | ON683419                 |
| H.D. Shin                                                                     | √            | LS               | Others         | Agarics    |                          |
| Marasmius oreades (Bolton) Fr.                                                 | √            | LS               | Edible, Medicinal | Agarics    |                          |
| Marasmius pallidocephalus Gilliam                                              | √            | LS               | Others         | Agarics    |                          |
| Marasmius polylepidis Dennis                                                   | √            | LS               | Others         | Agarics    |                          |
| Marasmius pseudonevus Singer                                                   | √            | LS               | Others         | Agarics    |                          |
| Marasmius pulcherripes Peck                                                    | √            | LS               | Others         | Agarics    |                          |
| Marasmius riparius Singer                                                      | √            | LS               | Others         | Agarics    |                          |
| Marasmius rotuloides Dennis                                                   | √            | LS               | Others         | Agarics    |                          |
| Marasmius sessiliaffinis Singer                                                | √            | LS               | Others         | Agarics    |                          |
| Marasmius siccus (Schwein.) Fr.                                                | √            | LS               | Others         | Agarics    |                          |
| Megacollybia platyphylla (Pers.) Kotl. and Pouzar                              | √            | WS               | Others         | Agarics    |                          |
| Melanoleta brevipes (Bull.) Pat.                                               | √            | SS               | Edible         | Agarics    |                          |
| Melanoleta grammopodia (Bull.) Murrill                                         | √            | SS               | Edible         | Agarics    | ON683466                 |
| Melanoleta melaleuca (Pers.) Murrill                                           | √            | SS               | Edible         | Agarics    |                          |
| Melanoleta strictipes (P. Karst.) Jul. Schäff.                                | √            | SS               | Edible         | Agarics    |                          |
| Melanoleta striula (Fr.) Singer                                                | √            | SS               | Others         | Agarics    |                          |
| Melanoleta verrucipes (Fr.) Singer                                             | √            | SS               | Edible         | Agarics    |                          |
| Melastiza chateri (W.G. Sm.) Boud.                                             | √            | SS               | Others         | Larger     | Ascomycetes              |
| Microporus affinis (Blume and T. Nees) Kuntze                                  | √            | WS               | Others         | PHT fungi  |                          |
| Microstoma floccosum (Sacc.) Raitv.                                            | √            | WS               | Others         | Ascomycetes|                          |
| Morchella conica (Sacc.) Raitv.                                                 | √            | SS               | Edible         | Ascomycetes|                          |
| Scientific Name                                | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|-----------------------------------------------|--------------|------------------|----------------|------------|--------------------------|
| Morchella crassipes (Vent.) Pers.             | ✓            | ✓                | SS             | Edible, Medicinal | Larger Ascomycetes       |
| Morchella esculenta (L.) Pers.                | ✓            | ✓                | SS             | Edible, Medicinal | Larger Ascomycetes       |
| Morchella vulgaris (Pers.) Gray               | ✓            |                  | SS             | Edible, Medicinal | Larger Ascomycetes       |
| *Mucidula brunnneomarginata* (Lj.N. Vassiljeva) | ✓            | ✓                | WS             | Edible     | Agarics                  |
| *Mucidula mucida* (Schrad.) Pat.              | ✓            | ✓                | WS             | Others     | Agarics                  |
| *Mutinus caninus* (Huds.) Fr.                 | ✓            | ✓                | SS             | Poisonous  | Gasteroid fungi          |
| *Mycoena alpithophora* (Berk.) Sacc.          | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena collybiformis* (Murrill) Murrill     | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena debilis* (Fr.) Quel.                 | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena epipterygia* (Scop.) Gray            | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena filopes* (Bull.) P. Kumm.            | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena flavescens* Velen.                   | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena fulginella* A.H. Sm.                 | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena galericulata* (Scop.) Gray           | ✓            |                  | LS             | Edible, Medicinal | Agarics                |
| *Mycoena haematopus* (Pers.) P. Kumm.         | ✓            | ✓                | LS             | Medicinal, Poisonous | Agarics                |
| *Mycoena inclinata* (Fr.) Quel.               | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena nucleata* X. He and X.D. Fang        | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena osmundicola* J.E. Lange              | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena pseudoandrosacea* (Bull.) Z.S. Bi    | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena pura* (Pers.) P. Kumm.               | ✓            | ✓                | LS             | Medicinal, Poisonous | Agarics                |
| *Mycoena rosea* Gramberg                      | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena sanguinolenta* (Alb. and Schwein.) P. | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena subcana* A.H. Sm.                    | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoena subgracilis* Métrod                  | ✓            |                  | LS             | Others     | Agarics                  |
| *Mycoleptodonoides pergaminae* (Yasuda) Aoshima and H. Furuk. | ✓ | ✓ | WS | Others | PHT fungi |
| Scientific Name                        | Distribution | Nutritional Mode | Economic Value | Categories         | GenBank Accession Number |
|---------------------------------------|--------------|------------------|----------------|--------------------|--------------------------|
| **Myxarium nucleatum** Wallr.          | √            | WS               | Others         | Larger Ascomycetes  |                          |
| **Naematelia aurantialba** (Bandoni and M. Zang) Millanes and Wedin | √            | WS               | Edible, Medicinal | Jelly fungi         |                          |
| **Neofusculus alveolaris** (DC.) Sotome and T. Hatt. **Neolentinus adhaerens** (Alb. and Schwein.) Redhead and Ginns | √            | WS               | Others         | PHT fungi          | ON683470                 |
| **Neolentinus cyathiformis** (Schaeff.) Della Magg. and Trassin. | √            | WS               | Edible, Medicinal | PHT fungi          |                          |
| **Neolentinus leptotus** (Fr.) Redhead and Ginns | √            | WS               | Edible, Medicinal, Poisonous PHT fungi | Ascomycetes |                          |
| **Nidula niveotomentosa** (Henn.) Lloyd | √            | WS               | Medicinal      | Agarics            |                          |
| **Omphalina lilaceorosea** Svřek and Kubička | √            | WS               | Others         | Agarics            |                          |
| **Omphalotus guepiniformis** (Berk.) Neda | √            | WS               | Poisonous      | Agarics            |                          |
| **Onnia tomentosa** (Fr.) P. Karst. | √            | WS               | Others         | PHT fungi          | Larger Ascomycetes      |
| **Ophiocordyceps nutans** (Pat.) G.H. Sung, J.M. Sung, Hywel-Jones, and Spatafora | √            | EI               | Medicinal      | Larger Ascomycetes  |                          |
| **Ophiocordyceps sphecocephala** (Klotzsch ex Berk.) G.H. Sung, J.M. Sung, Hywel-Jones, and Spatafora | √            | EI               | Medicinal      | Larger Ascomycetes  |                          |
| **Ossicaulis lignatilis** (Pers.) Redhead and Ginns | √            | WS               | Edible         | Agarics            |                          |
| **Ostina undosa** (Peck) Zmitr. | √            | WS               | Others         | PHT fungi          | Larger Ascomycetes      |
| **Otidea cochleata** (L.) Fuckel | √            | SS               | Poisonous      | Agarics            |                          |
| **Otidea leporina** (Batsch) Fuckel | √            | SS               | Others         | Agarics            |                          |
| **Oudemansiella radicata** (Relhan) Singer | √            | SS               | Others         | Agarics            |                          |
| **Panaeolus campanulatus** (L.) Quél. | √            | DS               | Others         | Agarics            |                          |
| **Panaeolus finnicola** (Pers.) Gillet | √            | DS               | Poisonous      | Agarics            |                          |
| **Panaeolus papilionaceus** (Bull.) Quél. | √            | DS               | Poisonous      | Agarics            |                          |
| **Panellus stipticus** (Bull.) P. Karst. | √            | WS               | Medicinal, Poisonous | Agarics | ON683472                  |
| Scientific Name | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|-----------------|--------------|------------------|----------------|------------|-------------------------|
| *Panus conchatus* (Bull.) Fr. | | | WS | Edible, Medicinal | Agarics | ON673473 |
| *Panus rudis* Fr. | | | WS | Others | Agarics | |
| *Paralepista splendens* (Pers.) Vizzini | √ | √ | SS | Others | Agarics | |
| *Paralepistopsis acromelalga* (Ichimura) Vizzini | | | SS | Poisonous | Agarics | |
| *Parasola plicatilis* (Curtis) Redhead, Vilgalys, and Hopple | √ | | SS | Medicinal | Agarics | |
| *Parasola leiocephala* (P.D. Orton) Redhead, Vilgalys and Hopple | √ | | SS | Others | Agarics | |
| *Paxillus involutus* (Batsch) Fr. | | | EM | Medicinal, Poisonous | Boletes | |
| *Perenniporia inflexibilis* (Berk.) Ryvarden | √ | | WS | Others | PHT fungi | |
| *Perenniporia medulla-panis* (Jacq.) Donk | | | WS | Others | PHT fungi | |
| *Perenniporia subacida* (Peck) Donk | | | WS | Medicinal | PHT fungi | |
| *Peziza ampliata* Pers. | | | SS | Others | Ascomycetes | |
| *Peziza badia* Pers. | | | SS | Poisonous | Ascomycetes | |
| *Peziza praetervisa* Bres. | | | SS | Others | Ascomycetes | |
| *Peziza sylvestris* (Boud.) Sacc. and Traverso | | | SS | Others | Ascomycetes | |
| *Peziza vesiculosa* Bolton | | | SS | Others | Ascomycetes | |
| *Phaeoclavulina abietina* (Pers.) Giachini | | | LS | Others | Coral fungi | |
| *Phaeoclavulina flavida* (Fr.) Giachini | | | LS | Poisonous | Coral fungi | |
| *Phaeolepiota aurea* (Matt.) Maire | | | SS | Edible, Poisonous | Ascomycetes | |
| *Phaeolus schweinitzii* (Fr.) Pat. | | | WS | Medicinal | PHT fungi | |
| *Phaeotremella foliacea* (Pers.) Wedin, J.C. Zamora and Millanes | | | EM | Edible, Medicinal | Jelly fungi | |
| *Phallus flavocostatus* Kreisel | | | SS | Others | Gasteroid fungi | ON683474 |
| Scientific Name | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|-----------------|--------------|------------------|----------------|------------|--------------------------|
| Phallus hadriani Vent. | ✓ | ✓ | SS | Others | Gasteroid fungi |
| Phallus impudicus L. | ✓ | ✓ | SS | Edible, Medicinal | Gasteroid fungi |
| Phallus indusiatus Vent. | ✓ | ✓ | SS | Others | Gasteroid fungi |
| Phallus rubicundus (Bosc) Fr. | ✓ | ✓ | SS | Others | Gasteroid fungi |
| Phallus rugulosus (E. Fisch.) Lloyd | ✓ | ✓ | SS | Medicinal, Poisonous | Gasteroid fungi |
| Phellinus gilicus (Schwein.) Pat. | ✓ | ✓ | WS | Others | PHT fungi |
| Phellinus igniarius (L.) Quel. | ✓ | ✓ | WS | Medicinal | PHT fungi |
| Phellodon fuligineoalbus (J.C. Schmidt) R.E. Baird | ✓ | ✓ | WS | Others | PHT fungi |
| Phellodon tomentosus (L.) Banker | ✓ | ✓ | WS | Edible | PHT fungi |
| Phillipsia domingensis (Berk.) Berk. ex Denison | ✓ | ✓ | WS | Others | Larger Ascomycetes |
| Phlebia tremellosa (Schrad.) Nakasone and Burds. | ✓ | ✓ | WS | Medicinal | PHT fungi |
| Phloeomana minutula (Sacc.) Redhead | ✓ | ✓ | WS | Others | Agarics |
| Phloeomana speirea (Fr.) Redhead | ✓ | ✓ | WS | Others | Agarics |
| Pholiota adiposa (Batsch) P. Kumm. | ✓ | ✓ | WS | Edible, Medicinal | Agarics |
| Pholiota aurivella (Batsch) P. Kumm. | ✓ | ✓ | WS | Edible, Medicinal | Agarics |
| Pholiota flammans (Batsch) P. Kumm. | ✓ | ✓ | WS | Edible, Medicinal, Poisonous | Agarics |
| Pholiota hiemalis A.H. Sm. and Hesler | ✓ | ✓ | WS | Others | Agarics |
| Pholiota lubrica (Pers.) Singer | ✓ | ✓ | WS | Edible, Medicinal, Poisonous | Agarics ON683475 |
| Pholiota mutabilis (Schaeff.) P. Kumm. | ✓ | ✓ | WS | Others | Agarics ON683476 |
| Pholiota spumosa (Fr.) Singer | ✓ | ✓ | WS | Edible, Medicinal | Agarics ON683477 |
| Pholiota squarrosa (Vahl) P. Kumm. | ✓ | ✓ | WS | Edible, Poisonous | Agarics |
| Pholiota squarrosoides (Peck) Sacc. | ✓ | ✓ | WS | Others | Agarics |
| Pholiota subflavida (Murrill) A.H. Sm. and Hesler | ✓ | ✓ | WS | Others | Agarics |
| Pholiota tuberculosa (Schaeff.) P. Kumm. | ✓ | ✓ | WS | Others | Agarics |
| Pholiota veris A.H. Sm. and Hesler | ✓ | ✓ | WS | Others | Agarics |
| Pholiota vinaceobrunnea A.H. Sm. and Hesler | ✓ | ✓ | WS | Others | Agarics |
## Table A1. Cont.

| Scientific Name                                                                 | Distribution | Nutritional Mode | Economic Value       | Categories          | GenBank Accession Number |
|---------------------------------------------------------------------------------|--------------|------------------|----------------------|---------------------|-------------------------|
| Pholiota terrestris Overh.                                                       | ✓ ✓ ✓ ✓        | WS               | Edible, Medicinal,   | Poisonous Agarics   |                         |
| Phyllotopsis nidulans (Pers.) Singer                                              | ✓ ✓ ✓ ✓        | WS               | Edible Agarics       |                     |                         |
| Physalacria lateriparies X. He and E.Z. Xue                                      | ✓ ✓ ✓ ✓        | WS               | Others Agarics       |                     |                         |
| Picipes badius (Pers.) Zmitr. and Kovalenko                                     | ✓ ✓ ✓ ✓        | WS               | Others PHT fungi     |                     | ON683478                |
| Picipes melanopus (Pers.) Zmitr. and Kovalenko                                  | ✓ ✓ ✓ ✓        | WS               | Others PHT fungi     |                     |                         |
| Pitoporos betulinus (Bull.) P. Karst.                                            | ✓ ✓ ✓ ✓        | WS               | Medicinal PHT fungi  |                     |                         |
| Plectania melastoma (Sowerby) Fuckel                                             | ✓ ✓ ✓ ✓        | WS               | Others Ascomycetes   |                     |                         |
| Pleuroflammula flavescens (Murrill) Singer                                        | ✓ ✓ ✓ ✓        | SS               | Others Agarics       |                     |                         |
| Pleuroflammula multifolia (Peck) E. Horak                                        | ✓ ✓ ✓ ✓        | SS               | Others Agarics       |                     |                         |
| Pleurotus citrinopileatus Singer                                                 | ✓ ✓ ✓ ✓        | WS               | Edible, Medicinal    | Agarics             | ON683479                |
| Pleurotus cornucopiae (Paulet) Quél.                                              | ✓ ✓ ✓ ✓        | WS               | Edible, Medicinal    | Agarics             |                         |
| Pleurotus corticus (Fr.) P. Kumm.                                                | ✓ ✓ ✓ ✓        | WS               | Others Agarics       |                     |                         |
| Pleurotus dryinus (Pers.) P. Kumm.                                               | ✓ ✓ ✓ ✓        | WS               | Edible, Medicinal    | Agarics             |                         |
| Pleurotus limpidus (Fr.) P. Kumm.                                                | ✓ ✓ ✓ ✓        | WS               | Edible Agarics       |                     |                         |
| Pleurotus ostreatus (Jaccq.) P. Kumm.                                            | ✓ ✓ ✓ ✓ ✓ ✓    | WS               | Edible, Medicinal    | Agarics             | ON683480                |
| Pleurotus polymorphaeus (Fr.) Quél.                                              | ✓ ✓ ✓ ✓ ✓ ✓    | WS               | Edible, Medicinal    | Agarics             | ON683481                |
| Pleurotus spodoecus (Fr.) Quél.                                                  | ✓ ✓ ✓ ✓        | WS               | Edible, Medicinal    | Agarics             |                         |
| Pleurotus atricapillus (Batsch) Fayod                                              | ✓ ✓ ✓ ✓        | WS               | Others Agarics       |                     |                         |
| Pleurotus atrorangipes (Konrad) Kühner                                           | ✓ ✓ ✓ ✓        | WS               | Edible Agarics       |                     |                         |
| Pleurotus aurantiorugosus (Trog) Sacc.                                           | ✓ ✓ ✓ ✓        | WS               | Edible Agarics       |                     | ON683482                |
| Pleurotus cervinus (Schaeff.) P. Kumm.                                           | ✓ ✓ ✓ ✓ ✓ ✓    | WS               | Edible Agarics       |                     |                         |
| Pleurotus depauperatus Romagn.                                                   | ✓ ✓ ✓ ✓        | WS               | Others Agarics       |                     |                         |
| Pleurotus leoninus (Schaeff.) P. Kumm.                                           | ✓ ✓ ✓ ✓        | WS               | Edible Agarics       |                     |                         |
| Pleurotus namus (Pers.) P. Kumm.                                                 | ✓ ✓ ✓ ✓        | WS               | Others Agarics       |                     |                         |
| Pleurotus petasatus (Fr.) Gillet                                                 | ✓ ✓ ✓ ✓        | WS               | Edible Agarics       |                     |                         |
| Pleurotus plautius (Weinm.) Gillet                                               | ✓ ✓ ✓ ✓        | WS               | Others Agarics       |                     |                         |
| Pleurotus salicinus (Pers.) P. Kumm.                                             | ✓ ✓ ✓ ✓        | WS               | Edible Agarics       |                     |                         |
| Pleurotus umbrosus (Pers.) P. Kumm.                                              | ✓ ✓ ✓ ✓        | WS               | Edible Agarics       |                     |                         |
| Podosordaria pedunculata (Dicks.) Dennis                                         | ✓ ✓ ✓ ✓        | WS               | Others Ascomycetes   |                     |                         |
| Polyporus alveolaris (DC.) Bondartsev and Singer                                 | ✓ ✓ ✓ ✓        | WS               | Others PHT fungi     |                     |                         |
| Polyporus badius (Pers.) Schwein.                                                 | ✓ ✓ ✓ ✓        | WS               | Others PHT fungi     |                     |                         |
Table A1. Cont.

| Scientific Name                                      | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|------------------------------------------------------|--------------|------------------|----------------|------------|--------------------------|
| **Polyporus brumalis** (Pers.) Fr.                   | √            | WS               | Others         | PHT fungi  | ON683483                 |
| **Polyporus conifericola** H.J. Xue and L.W. Zhou    | √            | WS               | Others         | PHT fungi  |                          |
| **Polyporus squamosus** (Huds.) Fr.                  | √            | WS               | Medicinal      | PHT fungi  |                          |
| **Polyporus tuberaster** (Jacq. ex Pers.) Fr.        | √            | WS               | Others         | PHT fungi  |                          |
| **Polystictus curius** (Pers.) Fr.                   | √            | WS               | Others         | PHT fungi  |                          |
| **Polystictus unicolor** Rick                        | √            | WS               | Medicinal      | PHT fungi  |                          |
| **Polystictus versicolor** (L.) Fr.                  | √            | WS               | Others         | PHT fungi  |                          |
| **Psathyrella candolleana** (Fr.) Maire              | √            | WS               | Medicinal      | Agarics    | ON683484                 |
| **Psathyrella hydrophila** (Bull.) Maire              | √            | WS               | Others         | Agarics    |                          |
| **Psathyrella multissima** (S. Imai) Hongo           | √            | WS               | Others         | Agarics    |                          |
| **Psathyrella submuda** (P. Karst.) A.H. Sm.         | √            | WS               | Others         | Agarics    |                          |
| **Pseudoclitocybe cyathiformis** (Bull.) Singer      | √            | SS               | Edible, Medicinal | PHT fungi |                          |
| **Pseudofavolus tenuis** (Fr.) G. Cunn.              | √            | WS               | Medicinal,     | Agarics    |                          |
| **Pseudohydnum gelatinosum** (Scop.) P. Karst.       | √            | WS               | Edible,        | Jelly fungi|                          |
| **Pseudosperma avellaneum** (Kobayasi) Matheny and   | √            | SS               | Others         | Agarics    |                          |
| **Pseudosperma rimosum** (Bull.) Matheny and         | √            | SS               | Others         | Agarics    |                          |
| **Pseudosperma umbrinellum** (Bres.) Matheny and     | √            | SS               | Others         | Agarics    |                          |
| **Pterula multifida** (Chevall.) Fr.                 | √            | SS               | Others         | Coral fungi| ON683486                 |
| **Pycnoporus cinnabarinus** (Jacq.) P. Karst.        | √            | SS               | Medicinal      | PHT fungi  |                          |
| **Pycnoporus sanguineus** (L.) Murrill               | √            | SS               | Medicinal      | PHT fungi  |                          |
| **Radulodon copelandii** (Pat.) N. Maek.             | √            | SS               | Others         | PHT fungi  |                          |
| **Ramaria apiculata** (Fr.) Donk                     | √            | EM               | Edible,        | Coral fungi|                          |
| **Ramaria botrytis** (Pers.) Bourd.                  | √            | EM               | Edible, Coral   | Coral fungi|                          |
| **Ramaria bourdotiana** Maire                        | √            | EM               | Edible, Coral   | Coral fungi|                          |
| **Ramaria flavo** (Schaeff.) Quel.                   | √            | EM               | Edible, Coral,  | Coral fungi|                          |
| Scientific Name                                      | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|-----------------------------------------------------|--------------|------------------|----------------|------------|--------------------------|
| Ramaria formosa (Pers.) Quél.                       |              |                   | EM             | Edible, Medicinal, Poisonous Coral fungi |
| Ramaria lutea Schild                                |              |                   | EM             | Edible Coral fungi |
| Ramaria madagascariensis (Henn.) Corner             |              |                   | EM             | Others Coral fungi |
| Ramaria stricta (Pers.) Quél.                       |              |                   | EM             | Edible Coral fungi |
| Ramaria subborytis (Coker) Corner                   |              |                   | EM             | Edible Coral fungi |
| Ramariopsis kunzei (Fr.) Corner                     |              |                   | EM             | Edible Coral fungi |
| Resupinatus applicatus (Batsch) Gray                |              |                   | WS             | Others Agarics |
| Rhizocybe vernicularis (Fr.) Vizzini, P. Alvarado, G. Moreno, and Consiglio |              |                   | SS             | Others Agarics |
| Rhizomarasmius undatus (Berk.) R.H. Petersen        |              |                   | SS             | Others Agarics |
| Rhodocollybia butyracea (Bull.) Lennox              |              |                   | SS             | Edible Agarics |
| Rhodocollybia proiza (Fr.) Antonin and Noordel.     |              |                   | SS             | Others Agarics |
| Rickenella fibula (Bull.) Raithelh.                 |              |                   | EM             | Others Cantharelloid fungi |
| Ripartites tricholoma (Alb. and Schwein.) P. Karst. |              |                   | LS             | Others Agarics | ON683428 |
| Russula adusta (Pers.) Fr.                          |              |                   | EM             | Edible Agarics |
| Russula aeruginea Lindblad ex Fr.                   |              |                   | EM             | Edible Agarics |
| Russula albida A. Blytt                            |              |                   | EM             | Edible Agarics |
| Russula alutacea (Fr.) Fr.                          |              |                   | EM             | Edible, Medicinal, Poisonous Agarics |
| Russula amoena Quel.                                |              |                   | EM             | Others Agarics |
| Russula aurata Fr.                                  |              |                   | EM             | Others Agarics |
| Russula aurea Pers.                                 |              |                   | EM             | Others Agarics |
| Russula chloroides (Krombh.) Bres.                  |              |                   | EM             | Edible Agarics | ON683429 |
| Russula crustosa Peck                                |              |                   | EM             | Edible, Medicinal Agarics |
| Russula cyanoxantha (Schaeff.) Fr.                  |              |                   | EM             | Edible, Medicinal Agarics | ON683430 |
| Russula delica Fr.                                  |              |                   | EM             | Edible, Medicinal Agarics |
| Russula densifolia Secr. ex Gillet                  |              |                   | EM             | Edible, Medicinal, Poisonous Agarics | ON683487 |
| Russula emetica (Schaeff.) Pers.                    |              |                   | EM             | Poisonous Agarics |
| Russula exalbicans (Pers.) Melzer and Zvára        |              |                   | EM             | Edible Agarics |
Table A1. Cont.

| Scientific Name                    | Distribution | Nutritional Mode | Economic Value | Categories       | GenBank Accession Number |
|------------------------------------|--------------|------------------|----------------|------------------|--------------------------|
| Russula faginea Romagn.            |              | EM               | Edible         | Agarics          |                          |
| Russula flavida Frost ex Peck      |              | EM, Poissonous   | Medicinal      | Agarics          |                          |
| Russula foetens Pers.              | √            | EM, Poissonous   | Medicinal      | Agarics          |                          |
| Russula fragilis Fr.               | √            | EM               | Edible         | Agarics          |                          |
| Russula furcata Pers.              |              | EM               | Edible         | Agarics          |                          |
| Russula grata Britzelm.            |              | EM               | Edible         | Agarics          |                          |
| Russula integra (L.) Fr.           |              | EM, Poissonous   | Medicinal      | Agarics          |                          |
| Russula lilacea Quél.              |              | EM               | Edible, Medicinal | Agarics          |                          |
| Russula mariae Peck                |              | EM               | Edible         | Agarics          | ON683488                |
| Russula mustelina Fr.              |              | EM               | Edible         | Agarics          | ON683489                |
| Russula nauseosa (Pers.) Fr.        |              | EM               | Edible         | Agarics          |                          |
| Russula paludosa Britzelm.         |              | EM               | Edible         | Agarics          |                          |
| Russula pectinata Fr.              |              | EM               | Poissonous     | Agarics          |                          |
| Russula pseudodelica J.E. Lange    |              | EM               | Edible, Medicinal | Agarics          |                          |
| Russula pueilaris Fr.              | √            | EM               | Edible         | Agarics          |                          |
| Russula pungens Beardslee          |              | EM               | Others         | Agarics          |                          |
| Russula risigallina (Batsch) Sacc. |              | EM               | Edible         | Agarics          |                          |
| Russula rosea Pers.                | √            | EM               | Edible, Medicinal | Agarics          |                          |
| Russula rubra (Lam.) Fr.           |              | EM               | Edible         | Agarics          |                          |
| Russula sanguinaria (Schumach.) Rauschert | | EM | Edible | Agarics | ON683431 |
| Russula sanguinea Fr.              | √            | EM               | Others         | Agarics          |                          |
| Russula sororia (Fr.) Romell       |              | EM               | Medicinal      | Agarics          | ON683432                |
| Russula squallida Peck             |              | EM               | Others         | Agarics          |                          |
| Russula subdepallens Peck          |              | EM               | Others         | Agarics          |                          |
| Russula tososa Lindblad            |              | EM               | Others         | Agarics          |                          |
| Sarcodontia spumea (Sowerby) Spirin |              | EM               | Others         | PHT fungi        |                          |
| Sarcomyxa edulis (Y.C. Dai, Niemelä, and G.F. Qin) T. Saito, Tonouchi, and T. Harada | | WS | Medicinal | Agarics          |                          |
| Sarcoscypha coccinea (Gray) Boud.  |              | WS               | Poisonous      | Ascomycetes      |                          |
| Scientific Name | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|----------------|--------------|------------------|----------------|------------|--------------------------|
| *Schizophyllum commune* Fr. | A1 A2 B1 B2 C1 C2 | WS | Edible, Medicinal | Agarics |  |
| *Scleroderma areolatum* Ehrenb. |  | SS | Edible, Medicinal, Poisonous | Gasteroid fungi |  |
| *Scleroderma bovista* Fr. |  | SS | Edible, Medicinal | Gasteroid fungi |  |
| *Scleroderma polyrhizum* (J.F. Gmel.) Pers. |  | SS | Edible, Medicinal | Gasteroid fungi |  |
| *Scutellinia pseudovitreola* W.Y. Zhuang and Zhu L. Yang |  | WS | Others | Larger Ascomycetes |  |
| *Scutellinia scutellata* (L.) Lambotte |  | WS | Edible, Medicinal | Larger Ascomycetes | ON683490 |
| *Sparassis latifolia* Y.C. Dai and Zheng Wang |  | WS | Others | PHT fungi |  |
| *Spathularia flavida* Pers. |  | SS | Others | Larger Ascomycetes |  |
| *Sphaerobolus stellatus* Tode |  | WS | Others | Gasteroid fungi |  |
| *Spongiporus zebra* (Y.L. Wei and W.M. Qin) B.K. Cui, L.L. Shen, and Y.C. Dai |  | WS | Others | PHT fungi |  |
| *Steccherinum ochraceum* (Pers. ex J.F. Gmel.) Gray |  | WS | Others | PHT fungi |  |
| *Steccherinum rawakense* (Pers.) Banker |  | WS | Others | PHT fungi |  |
| *Stereum hirsutum* (Willd.) Pers. |  | WS | Medicinal | PHT fungi |  |
| *Stereum rugosum* Pers. |  | WS | Others | PHT fungi |  |
| *Stereum subtomentosum* Pouzar |  | WS | Others | PHT fungi |  |
| *Stereum ostrea* (Blume and T. Nees) Fr. |  | WS | Others | PHT fungi |  |
| *Strobilurus stephanocystis* (Kühner and Romagn. ex Hora) Singer |  | WS | Others | Agarics |  |
| *Stropharia acreginosa* (Curtis) Quél. |  | SS | Edible, Poisonous | Agarics |  |
| *Stropharia rugosaonnulta* Farl. ex Murrill |  | SS | Edible, Medicinal | Agarics |  |
| *Suillus luridus* (Schaeff.) Murrill |  | EM | Edible, Medicinal | Boletes | ON683433 |
| *Suillus bovinus* (L.) Roussel |  | EM | Edible, Medicinal, Poisonous | Boletes |  |
| *Suillus flavus* (Quél.) Singer |  | EM | Others | Boletes |  |
| *Suillus granulatus* (L.) Roussel |  | EM | Edible, Medicinal, Poisonous | Boletes |  |
| *Suillus grevillei* (Klotzsch) Singer |  | EM | Edible, Medicinal | Boletes |  |
| *Suillus lactifluus* (With.) A.H. Sm. and Thiers |  | EM | Edible | Boletes |  |
Table A1. Cont.

| Scientific Name                                      | Distribution | Nutritional Mode | Economic Value            | Categories          | GenBank Accession Number |
|------------------------------------------------------|--------------|------------------|---------------------------|---------------------|--------------------------|
| *Suillus laricinus* (Berk.) Kuntze                   | ✓            | ✓                | EM                        | Others              | Boletes                  |
| *Suillus luteus* (L.) Roussel                        | ✓            | ✓                | EM                        | Edible, Medicinal,  | Poisonous                |
| *Suillus spraguei* (Berk. and M.A. Curtis) Kuntze    | ✓            | ✓                | EM                        | Others              | Boletes                  |
| *Suillus subaureus* (Peck) Snell                     | ✓            | ✓                | EM                        | Edible, Medicinal   | Boletes                  |
| *Suillus viscidus* (L.) Roussel                      | ✓            | ✓                | EM                        | Edible, Medicinal   | Boletes                  |
| *Tapinella atrotomentosa* (Batsch) Šutara             | ✓            | ✓                | EM                        | Poisonous           | Boletes                  |
| *Tapinella panuoides* (Fr.) E.-J. Gilbert            | ✓            | ✓                | EM                        | Poisonous           | Boletes                  |
| *Terana caerulea* (Lam.) Kuntze                      | ✓            | ✓                | WS                        | Others              | PHT fungi                |
| *Tetrapyrgos nigripes* (Fr.) E. Horak                | ✓            | ✓                | WS                        | Others              | Agarics                  |
| *Thelephora anthocephala* (Bull.) Fr.                | ✓            | ✓                | SS                        | Others              | PHT fungi                |
| *Thelephora palmata* (Scop.) Fr.                     | ✓            | ✓                | SS                        | Others              | PHT fungi                |
| *Tolypocladium capitatum* (Holmsk.) C.A. Quandt,     | ✓            | ✓                | EI                        | Others              | Larger Ascomycetes       |
| Kepler, and Spatafora                                |              |                  |                           |                     |                          |
| *Trametes coccinea* (Fr.) Hai J. Li and S.H. He      | ✓            | ✓                | WS                        | Others              | PHT fungi                |
| *Trametes conchifer* (Schwein.) Pilát                | ✓            | ✓                | WS                        | Others              | PHT fungi                |
| *Trametes gibbosa* (Pers.) Fr.                       | ✓            | ✓                | WS                        | Medicinal           | PHT fungi                |
| *Trametes hirsuta* (Wulfen) Lloyd                    | ✓            | ✓                | WS                        | Medicinal           | PHT fungi                |
| *Trametes membranacea* (Sw.) Kreisel                 | ✓            | ✓                | WS                        | Others              | PHT fungi                |
| *Trametes pubescens* (Schumach.) Pilát               | ✓            | ✓                | WS                        | Edible, Medicinal,  | PHT fungi                |
| *Trametes suecensis* (L.) Fr.                        | ✓            | ✓                | WS                        | Poisonous           | PHT fungi                |
| *Trametes trogi* Berk.                               | ✓            | ✓                | WS                        | Medicinal           | PHT fungi                |
| *Trametes versicolor* (L.) Lloyd                     | ✓            | ✓                | WS                        | Medicinal           | PHT fungi                |
| *Tremella aurantia* Schwein.                         | ✓            | ✓                | WS                        | Edible              | Jelly fungi              |
| *Tremella foliacea* Pers.                            | ✓            | ✓                | WS                        | Others              | Jelly fungi              |
| *Tremella fusiformis* Berk.                          | ✓            | ✓                | WS                        | Edible, Medicinal   | Boletes                  |
| *Tremella mesenterica* (Schaeff.) Pers.              | ✓            | ✓                | WS                        | Edible, Medicinal   | Jelly fungi              |
| *Trichaptum abietinum* (Pers. ex J.F. Gmel.) Ryvarden| ✓            | ✓                | WS                        | Medicinal           | PHT fungi                |
| *Trichaptum bifforme* (Fr.) Ryvarden                 | ✓            | ✓                | WS                        | Medicinal           | PHT fungi                |
| *Trichaptum pargamenum* (Fr.) G. Cunn.               | ✓            | ✓                | WS                        | Others              | PHT fungi                |
| Scientific Name | Distribution | Nutritional Mode | Economic Value | Categories | GenBank Accession Number |
|----------------|--------------|------------------|----------------|------------|--------------------------|
|                | A1 | A2 | B1 | B2 | C1 | C2 |                           |                           |                           |                          |
| **Tricholoma acerbum** (Bull.) Quél. | √ |     |     |     |     |     | EM | Edible, Medicinal, Edible, Medicinal, Poisonous | Agarics |
| **Tricholoma album** (Schaeff.) P. Kumm. | √ | √ |     |     |     |     | EM | Edible, Medicinal, Poisonous | Agarics |
| **Tricholoma aurantium** (Schaeff.) Ricken | √ |     |     |     |     |     | EM | Edible, Poisonous | Agarics |
| **Tricholoma equestre** (L.) P. Kumm. | √ | √ |     |     |     |     | EM | Edible, Medicinal | Agarics |
| **Tricholoma matsutake** (S. Ito and S. Imai) Singer | √ | √ |     |     |     |     | EM | Edible, Poisonous | Agarics |
| **Tricholoma scalpturatum** (Fr.) Quél. | √ |     |     |     |     |     | EM | Others | Agarics |
| **Tricholoma terreum** (Schaeff.) P. Kumm. | √ | √ |     |     |     |     | EM | Others | Agarics |
| **Tricholoma tigrinum** (Schaeff.) Gillet | √ |     |     |     |     |     | EM | Poisonous | Agarics |
| **Tricholoma vaccinum** (Schaeff.) P. Kumm. | √ |     |     |     |     |     | EM | Edible, Medicinal | Agarics |
| **Tricholomopsis decora** (Fr.) Singer | √ |     |     |     |     |     | WS | Edible | Agarics |
| **Tricholomopsis rutilans** (Schaeff.) Singer | √ | √ | √ | √ | √ | √ | WS | Poisonous | Agarics |
| **Tulostoma bonianum** Pat. | √ |     |     |     |     |     | SS | Others | Gasteroid fungi |
| **Turbinellus floccosus** (Schwein.) Earle ex Giachini and Castellano | √ | √ |     |     |     |     | EM | Poisonous | Cantharelloid fungi |
| **Verpa bohemica** (Krombh.) J. Schröt. | √ |     |     |     |     |     | SS | Edible, Medicinal | Larger Ascomycetes |
| **Verpa digitaliformis** Pers. | √ |     |     |     |     |     | SS | Poisonous | Larger Ascomycetes |
| **Vitreoporus dichrous** (Fr.) Zmitr. | √ |     |     |     |     |     | WS | Others | PHT fungi |
| **Volvariella bombycina** (Schaeff.) Singer | √ |     |     |     |     |     | WS | Edible, Medicinal | Agarics |
| **Volvariella pusilla** (Pers.) Singer | √ | √ |     |     |     |     | SS | Edible, Medicinal | Agarics |
| **Volvopluteus gloiocephalus** (DC.) Vizzini, Contu and Justo | √ |     |     |     |     |     | SS | Poisonous | Agarics |
| **Xanthochrous gilvicolor** (Lloyd) Teng | √ |     |     |     |     |     | WS | Others | PHT fungi |
| **Xerocomellus chrysenteron** (Bull.) Šutara | √ |     |     |     |     |     | EM | Others | Boletes |
| **Xerocomus chrysenteron** (Bull.) Quél. | √ | √ |     |     |     |     | EM | Others | Boletes |
| **Xerophalina campanella** (Batsch) Kühner and Maire | √ | √ | √ | √ | √ | √ | WS | Medicinal | Agarics |
| **Xerula pudens** (Pers.) Singer | √ |     |     |     |     |     | WS | Others | Agarics |
| Scientific Name                      | A1 | A2 | B1 | B2 | C1 | C2 | Nutritional Mode | Economic Value | Categories    | GenBank Accession Number |
|------------------------------------|----|----|----|----|----|----|------------------|----------------|--------------|------------------------|
| *Xylaria carpophila* (Pers.) Fr.    |    |    | √  |    |    | √  | WS               | Medicinal      | Larger Ascomycetes |                        |
| *Xylaria hypoxylon* (L.) Grev.      | √  |    | √  |    |    |    | WS               | Others         | Larger Ascomycetes |                        |
| *Xylaria polymorpha* (Pers.) Grev.  | √  |    |    |    | √  |    | WS               | Others         | Larger Ascomycetes |                        |

Note: EM = ectomycorrhizal; SS = soil saprotroph; WS = wood saprotroph; LS = litter saprotroph; DS = dung saprotroph; EI = endophyte insect pathogen.
Table A2. Species scientific names and their corresponding abbreviations.

| Abbreviation | Genus          | Abbreviation | Genus          | Abbreviation | Genus          | Abbreviation | Genus          | Abbreviation | Genus          | Abbreviation | Genus          |
|--------------|----------------|--------------|----------------|--------------|----------------|--------------|----------------|--------------|----------------|--------------|----------------|--------------|
| Abo          | Abortiporus    | Dac          | Dacrymyces     | Lec          | Leccinum       | Pip          | Piptoporus     |              |                |              |                |              |
| Aga          | Agaricus       | Dac          | Dacrypinax     | Len          | Lentinellus    | Ple          | Pleurotus      |              |                |              |                |              |
| Agr          | Agrocybe       | Daed          | Daedalea       | Lent          | Lentinus       | Plu          | Pluteus        |              |                |              |                |              |
| Ale          | Aleuria        | Daed          | Daedaleopsis   | Lenz          | Lenzites       | Pol          | Polyvarpus     |              |                |              |                |              |
| Ama          | Amanita        | Daed          | Daldinia       | Leo           | Leotia         | Poly         | Polystictus    |              |                |              |                |              |
| Amp          | Ampulloclitocybe| Dec          | Deconica       | Lep           | Lepiota        | Pos          | Postia         |              |                |              |                |              |
| Api          | Apieperon      | Des          | Descolea       | Lepi          | Lepista        | Ps            | Psathyrella    |              |                |              |                |              |
| Arm          | Armillaria     | Dum          | Dumentinia     | Leu           | Leucoagaricus  | Pse          | Pseudoclitocybe|              |                |              |                |              |
| Art          | Artromyces     | Ent          | Entoloma       | Leuc          | Leucoagyrus    | Pseu         | Pseudosperma   |              |                |              |                |              |
| Asc          | Ascomycetes    | Exi          | Exidia         | Lyc           | Lycomperdon    | Pte          | Pterula        |              |                |              |                |              |
| Aur          | Auricularia    | Flam         | Flammulaster   | Lyo           | Lophyllum      | Pyc          | Pycnoporus     |              |                |              |                |              |
| Auri         | Auriscalpium   | Flamm         | Flammulina     | Lys           | Lysurus        | Rad          | Radulodon      |              |                |              |                |              |
| Bis          | Bisporella     | Fom          | Fomes          | Mac           | Macrocystidium | Ram          | Ramaria        |              |                |              |                |              |
| Bje          | Bjerandera     | Fomi         | Fomitopsis     | Macr          | Macropleiotia  | Res          | Resupinatus    |              |                |              |                |              |
| BolI         | Boletinellus   | Gal          | Galerina       | Mar           | Marasmiellus   | Rho          | Rhodocyllia    |              |                |              |                |              |
| Bol          | Boletus        | Gan          | Ganoaderma     | Mara           | Marasmius      | Ric          | Rickenella     |              |                |              |                |              |
| Cal1         | Calocera       | Gea          | Geastrum       | Mel           | Melanoleuca    | Rus          | Russula        |              |                |              |                |              |
| Calo         | Calocybe       | Ger          | Gerronema       | Mor           | MORCHELLA      | Sar          | Sarcoconia     |              |                |              |                |              |
| Cal          | Calvatia       | Glo           | Gloeophrlyllum | Mac           | Maciudula      | Sar          | Sarcomyces     |              |                |              |                |              |
| Can          | Cantharellus   | Gloe          | Gloeostereum   | Mut           | Mutinus        | Sarc         | Sarcoscypha    |              |                |              |                |              |
| Cer          | Ceriporos      | Gue          | Guiporia       | Myc           | Mycena         | Sch          | Schizophyllum  |              |                |              |                |              |
| Che          | Cheilymenia    | Gym           | Gymnopus       | Neo            | Neofavolus     | Scl          | Scleroderma    |              |                |              |                |              |
| Chl          | Chlorociboria  | Gymn          | Gymnoporus     | Neol          | Neolentines    | Scu          | Scutellinia    |              |                |              |                |              |
| Chr          | Chroogomphus   | Har           | Harraja        | Omp            | Omphalotus     | Spa          | Spathularia    |              |                |              |                |              |
| Cla          | Clavaria       | Hel           | heliuma        | Oph            | Ophiocercoecys | Ste          | Stecerenium    |              |                |              |                |              |
| Clav         | Clavariadelphus| Hem           | Hemistophobia  | Oss            | Ossicaulis     | Ste          | Stereum        |              |                |              |                |              |
| Clavu        | Clavulina      | Her           | Hericium       | Oti            | Otidea         | Str          | Stropharia     |              |                |              |                |              |
| Clavul       | Clavulinopsis  | Hor           | Heterobasison  | Pan            | Panaeolus      | Sui          | Suillus        |              |                |              |                |              |
| Clavu1       | Clavulinopsis  | Hor           | Heterobasison  | Pan            | Panaeolus      | Sui          | Suillus        |              |                |              |                |              |
| Cli          | Clitocybe      | Hoh           | Hohenhuelcha   | Pane           | Panellus       | Tap          | Tapinella      |              |                |              |                |              |
| Col          | Coltricia      | Hum           | Humaria        | Panu           | Panus          | Ter           | Terana         |              |                |              |                |              |
| Con          | Cononopus      | Hyd           | Hydnum         | Par            | Paralepista    | The          | Thelephora     |              |                |              |                |              |
| Cono         | Conocybe       | Hygr          | Hygrocybe      | Para           | Parasola       | Tra          | Trametes       |              |                |              |                |              |
| Cop          | Coprinellus    | Hygr          | Hygrophor     | Pax            | Paxillus       | Tre          | Tremella       |              |                |              |                |              |
| Copri        | Coprinopsis    | Hym           | Hymenopelis    | Per            | Perenponeria   | Tri          | Trichaptum     |              |                |              |                |              |
| Cor          | Coprinus       | Hyp           | Hypoholoma     | Pez            | Peziza         | Tric         | Tricholoma     |              |                |              |                |              |
| Cori         | Cordyceps      | Hyp           | Hypsyzgus      | Pha            | Phaeolepota    | Trich         | Tricholomopsis |              |                |              |                |              |
| Corioulipos  | Coriolis       | Inf           | Infuliduliclyce| Phae           | Phaeotremla    | Tul          | Tulostoma      |              |                |              |                |              |
| Curt         | Cortinarius    | Ino           | Inocyce        | Pha            | Phallus        | Tur          | Turbinellus    |              |                |              |                |              |
| Cot          | Cotylidia      | Ino           | Inonotus       | Phe            | Phellinus      | Vol          | Volvariella    |              |                |              |                |              |
| Cre          | Crepidotus     | Irp           | Irpx           | Phel           | Phelidion      | Volv          | Volvoluteus    |              |                |              |                |              |
| Cup          | Cuphophylius   | Kue           | Kuehneromyces  | Phil           | Phleomana      | Xer1         | Xerocomius     |              |                |              |                |              |
| Cya          | Cyathus        | Lac           | Laccaria       | Pho            | Pholiota       | Xer          | Xeromphalina   |              |                |              |                |              |
| Cyc          | Cyclocybe      | Lact          | Lactarius      | Phy            | Phylotopsis    | Xyl          | Xylaria        |              |                |              |                |              |
| Cys          | Cystoderma     | Lact          | Laetiporus     | Pic            | Picipes        |              |                |              |                |              |                |              |

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