Distribution of Mushrooms in the Resort Cikaniki at Mount Halimun Salak National Park

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Abstract. Mount Halimun Salak National Park (TNGHS) is one of the conservation areas in West Java. One of the areas in TNGHS is Cikaniki Resort which has various mushrooms. Mushroom is one of the potential biodiversity that has been developed for various purposes such as food, medicine and others. The purpose of this study was to determine the potential of mushroom and the distribution of mushroom in the cikaniki resort of Mount Halimun Salak National Park. The method was line transect. The results of this study were that there were 50 types of mushrooms, 35 mushrooms known to the name of the species and 15 unknown names of mushroom which distribution to an altitude of 1638 masl. Mushrooms were used as food producers such as, Agaricus bisporus, Auricularia polytricha, Agarics, Auricularia delicate, and Tramella fuciformis. Mushrooms were used as medicines such as Ganoderma applanatum, Laetiporus sp., And Phellinus linteus.

1. Introduction

Cikaniki Station is in the eastern part of Gunung Halimun Salak National Park (TNGHS) at an altitude of 900 meters above sea level. The area of the Cikaniki Resort is 2,782.59 Ha. The Cikaniki Research Station building was created in 1996 by Japan International Cooperation Agency (JICA) and has been used for research international and national researchers. The Cikaniki research station is a place that represents a natural tropical rainforest ecosystem.

Cikaniki Resort has various natural flora and fauna resources including mushrooms. Mushrooms have their own uniqueness, and are part of the diversity of species of living things. The mushrooms found at the Cikaniki Resort include macroscopic mushroom. Macroscopic mushrooms are mushrooms whose fruiting bodies can be seen in plain view without using a microscope [1]. Data and literature on macroscopic mushrooms are generally about macroscopic mushrooms in subtropical climates that have different colors, shapes, sizes, and species with macroscopic mushrooms in tropical climates. On the other hand, we are facing to the rapid decline of biodiversity both by natural processes and by human activities. If this continues, then many unidentified macroscopic mushroom species may soon become extinct. Macroscopic mushrooms are good indicators to detect changes in the environment [2].

Some types of mushroom may have many benefits for humans, even most of the mushrooms have been used as food ingredients and sources of ingredients for traditional and modern medicines [3]. According to L. Secco [4] that other benefits that can be obtained from wild mushrooms, are trade commodities that can be consumed. Mushrooms have an important role in maintaining the balance of forest ecosystems. In the ecological aspect, mushrooms have a role as decomposers that accelerate the nutrient cycling in the forest, through the process of weathering organic matter on the forest floor. The existence of mushroom in the forest as a perpetrator of fragmentation needs to be identified to...
determine the potential, role, benefits, and management. This is done mainly on mushrooms that grow in forest areas with conservation functions, one of which is in the National Park [5].

The purpose of this study was to determine the potential of mushroom and the distribution of mushroom in the Cikaniki resort of Gunung Halimun Salak National Park. The expected result of this study was that we know that there are various varieties of mushrooms found in Cikaniki Resort which can be used as food, medicine and others.

2. Method

2.1. Materials
The research was carried out at Cikaniki Resort, Gunung Halimun National Park - Salak, Bogor Regency, West Java Province, January-March 2018. Figure 1.

![Figure 1. Research Location Map](image)

Tools and materials used: The Zone Map serves as a guide in the field to arrive at the desired location, GPS functions to determine the coordinates at the beginning of observation and object coordinates, The camera is used to take photos, a ruler to measure mushroom height and width, Tally sheet functions to record field observations, Road boards function to help research in the field so that it was easier and more practical in recording or writing, Laptop is used to process data that has been obtained in the field, Arcgis program serves to assist in making maps, Stationery serves to record and process the data obtained.

2.2. Procedure
The method used in this study was the line transect method [6]. The line transect method, which was an observation, is carried out by tracing an elongated transect with a width of 10 m right and 10 m to the left with a path length of 1000 m / plot (Figure 2). The plot used was 30 plots in total.
2.2.1 Research methods:
Line 1 starts plots one to ten: Plots one through ten through the trail loop path 18 km past the Suzuki lane (900 - 1,150 m asl) Lowland forest colline zones. Line 2 starts from plot eleven to twenty: Plot eleven to twenty, that is through Mountain Kendeng with Kendeng 2 peaks (Sub montane forest zone. Second type between 1,050-1,400 m asl). Line 3 starts the twenty-one to thirty plots: Plot twenty-one to thirty through the 38 km Loop Trail line and will meet the end point on Marzuki Hill (1,500 m asl with the montane forest zone). Data collected through research channels, mushroom found in the observation area, first-observed visually, then documented and recorded. The environmental conditions at the location of the mushroom discovery are also recorded in the tally sheet. Point locations were stored using GPS. Data analysis was carried out descriptively, data from identification results were tabulated and presented in the form of tables of scientific names, local names, habitat for the discovery of mushroom and locations found. The trekking trail that becomes the observation track was presented in the form of a map with the help of Arcgis program.

3. Result and discussion

3.1 Potential of Mushrooms
Research conducted at the Cikaniki resort in Gunung Halimun-Salak National Park with air humidity ranged from 57-66%, and soil moisture ranged from 80-99%. Light intensity and air circulation have an effect on mushroom growth. The intensity of light contained in the Cikaniki Resort forest area was sufficient for lighting the understorey or mushrooms that grow on dead tree trunks. The tree head was quite tightly affecting the intensity of the light entering and supporting the growth of the mushroom. This was in accordance with A. E. Wahyudi et al. [3] which showed that mushroom found at the time of the study were found to grow on dead wood at 28°C, humidity 71% and light intensity 0.28 Cd. According to Karmilasanti [7] To grow properly, generally macroscopic mushroom are influenced by several parameters of habitat conditions (tread) that are appropriate, including humidity, temperature and light intensity. The same thing stated by Agustini [8] states that microbial populations are more influenced by environmental factors, such as pH, air relative humidity (RH), temperature, substrate where it grows in the microbial ecological niche.

The types of mushrooms found at Cikaniki Resort were 50 species. At least 35 types were identified and 15 types were not identified or Unknown Name (UKN). These-mushroom were found directly in the Cikaniki Resort area (Table 1).

Most of the Mushrooms found in the research are living on wood that is dead or decayed, including Pakis (Cycas sp), Rasamala (Altingia exelsa), Ki Hujan (Samanea saman), Saninten (Castanopsis argentea), Ki Tembaga (Gluta renghas). Mushrooms found were generally on weathered wood and soil substrates. This condition shows the function of Mushrooms as decomposers or degradation of dead organisms. Aside from being a decomposer or degradation of dead organisms, mushrooms play a role in facilitating nutrients on the surface and in the soil so that they are available to plants. According to Suhardiman [9] mushrooms are very closely related to wood weathering. Mushrooms grow by utilizing sources of food derived from weathering wood or the surrounding environment, both wood that is experiencing weathering or wood that has been weathered.
### Table 1. Mushrooms found at the Cikaniki Resort research location are based on alphabetical order

| No | Family                  | Species             | Local Name / Mushroom function | Habitat / Location                        |
|----|-------------------------|---------------------|---------------------------------|------------------------------------------|
| 1. | Agaricaceae             | Agaricus bisporus   | Supa Champignon/antioxid ant, Food | Dead Pakis (Cycas sp) / line 3           |
| 2. | Agaricaceae             | Agaricus repandum   | antioxidant                      | Dead Rasamala Tree (Altingia exelsa) / line 1 |
| 3. | Agaricaceae             | Agarics             | Supa Payung                      | Dead Ki Hajar tree / line 1              |
| 4. | Agaricaceae             | Agarics silvaticus  | anti oxidant,                    | moist soil / line 3                      |
| 5. | Amanitaceae             | Amanita phalloidea  |                                | Dead Ki Hajar tree / line 1              |
| 6. | Physalacriaceae         | Armillaria mucida   |                                | moist soil / line 2                      |
| 7. | Auriculariaceae         | Auricularia         | Supa Kuping/polytricha          | Dead Ki Tembaga tree (Gluta renghas) / line 1 |
| 8. | Auriculariaceae         | Auricularia         | Supa Jantung/delicata           | Dead Ki Hujan tree (Samanea s)an / line 1 |
| 9. | Agaricaceae             | Bovista plumbea     | Supa Bulan/                     | Dead Rasamala tree (Altingia exelsa) / line 2 - 3 |
| 10. | Clavariaceae            | Clavaria sp.        | Supa Karang/anti oxidant,       | Dead Rasamala tree (Altingia exelsa) / line 1 - 2 |
| 11. | Agaricaceae             | Coprinus sp.        | anti oxidant,                   | Dead Ki Hajar tree / line 2              |
| 12. | Corticiaceae            | Corticium           | Jamur Upas                       | moist soil / line 1 - 3                  |
| 13. | Entolomataceae          | Entoloma vernum     | -                               | Dead Rasamala tree (Altingia exelsa) / line 2 - 3 |
| 14. | Ganodermataceae         | Ganoderma applanatum| Supa Sinduk/Antitumor, immunodulator | Dead Pakis (Cycas sp) / line 2          |
| 15. | Ganodermataceae         | Ganoderma lucidum   | Supa Badak/Anti infamisi, hepato protektor, hipoglikemi, hipotensi, and hipolipidemik | Dead Rasamala (Altingia exelsa) tree / line 2 |
| 16. | Hygrophoraceae          | Hygroporus panicosus| -                               | moist soil / line 3                      |
| 17. | Hymenochaetaceae        | Hymenochaete        | -                               | Dead Ki Hujan (Samanea saman) tree / line 2 |
| 18. | Fomitopsidaceae         | Laetiporus sp.      | Causes damage to wood           | Dead Rasamala (Altingia exelsa) tree / line 2 |
| 19. | Agaricaceae             | Lycoperdon perlatum| Food                            | moist soil / line 3                      |
| 20. | Marasmiaceae            | Marasmius sp.       | Supa Tanah/Anti-bacterial, anti oxidant, animal feed | Dead Ki Hujan (Samanea saman) tree / line 3 |
| 21. | Polyporaceae            | Microporus affinis  | -                               | Dead Saninten (Castanopsis argentea) tree / line 1 |
| 22. | Mycenaceae              | Mycena rossella     | Anti mikroba                    | Dead Ki Tembaga (Gluta renghas) tree / line 2 |
| 23. | Mycenaceae              | Mycena leaiana      | Anti bakteri                     | Dead Ki Hujan (Samanea saman) tree / line 3 |
| No. | Family           | Genus                  | Mushroom function                                    | Notes/Line |
|-----|------------------|------------------------|-------------------------------------------------------|------------|
| 24. | Mycenaceae       | *Mycena luxaeterna*    | Glowing mushroom/ Anti mikroba                       | Dead Ki Hiur (*Castanopsis javanica*) tree/line 1-3 |
| 25. | Pleurotaceae     | *Pleurotus ostreatus*  | Jamur tiram / Anti bakteri,anti jamur                 | Dead Ki Hujan (*Samanea saman*) tree/line 1        |
| 26. | Hymenochaeteae   | *Phellinus linteus*    | Bioremediasi, anti kanker                            | Dead Ki Hujan (*Samanea saman*) tree/line 1        |
| 27. | Psathyrellaceae  | *Paracola plicatilis*  | -                                                     | Dead Rotan Badak (*Plectocormia elongata*) line 2   |
| 28. | Stereaceae       | *Stereum Ostrea*       | Anti mikroba                                          | Dead Pohon Saninten (*Castanopsis argentea*) tree/line 2 |
| 29. | Polyporaceae     | *Trametes versicolor*  | Anti oksidan                                          | Dead Saninten (*Castanopsis argentea*) tree/line 2 |
| 30. | Tremellaceae     | *Tramella fuciformis*  | Supa Lember Agar / food                               | Dead Ki Anak (*Castanopsis acuminatissima*) tree/line 2 |
| 31. | Tremellaceae     | *Tramella mesenterica* | Prevent cancer                                       | DeadPakis (*Cycas sp*) line 2                       |
| 32. | Xylariaceae      | *Xylaria tubacina*     | Anti bakteri                                          | moist soil/line 2                                  |
| 33. | -                | *Supa Nyirwan*         |                                                       | Pohon Rasamala (*Altingia exelsa*) sudah mati/ Jalur 3 |
| 34. | -                | *Supa Hingkik*         |                                                       | Dead Rasamala tree(*Altingia exelsa*) /line 2      |
| 35. | Pluteaceae       | *Volvariella volvacea* | Jamur merang/ food                                   | moist soil / line 2                                 |
| 36. | UKN 1            | -                      |                                                       | Dead Ki Tembaga (*Gluta renghas*) tree/line 2       |
| 37. | UKN 2            | -                      |                                                       | Dead Rasamala(*Altingia exelsa*) tree/line 3       |
| 38. | UKN 3            | -                      |                                                       | Dead Ki Anak(*Castanopsis acuminatissima*) tree/line 1 |
| 39. | UKN 4            | -                      |                                                       | Dead Ki Anak (*Castanopsis acuminatissima*) tree/line 1 |
| 40. | UKN 5            | -                      |                                                       | Dead Rasamala (*Altingia exelsa*) tree /line 3     |
| 41. | UKN 6            | -                      |                                                       | Dead Ki Hujan (*Samanea saman*) tree 3              |
| 42. | UKN 7            | -                      |                                                       | Dead Ki Tembaga (*Gluta renghas*) tree/ line 3     |
| 43. | UKN 8            | -                      |                                                       | Dead Ki Anak (*Castanopsis acuminatissima*) tree/line 3 |
| 44. | UKN 9            | -                      |                                                       | Dead Ki Tembaga (*Gluta renghas*) tree/line 3      |
| 45. | UKN 10           | -                      |                                                       | Dead Saninten (*Castanopsis argentea*) tree/ line 3 |
| 46. | UKN 11           | -                      |                                                       | Dead Rasamala (*Altingia exelsa*) tree/line 3      |
| 47. | UKN 12           | -                      |                                                       | moist soil / line 3                                 |
| 48. | UKN 13           | -                      |                                                       | Dead Saninten (*Castanopsis argentea*) tree/ line 2 |
| 49. | UKN 14           | -                      |                                                       | moist soil / line 2                                 |
| 50. | UKN 15           | -                      |                                                       | Dead Saninten (*Castanopsis argentea*) tree/ line 3 |
Suitable habitat conditions that contain carbohydrates, cellulose and lignin can affect the development of the Mushrooms body [10]. The result of this research found 50 Mushrooms, 22 families and 35 Mushrooms that could be known for their species. Most Mushrooms found can be used as food such as *Agaricus bisporus*, *Auricularia polytricha*, *Agarics*, *Auricularia delicate*, and *Tramella fuciformis*, *Bovista plumbea*, *Lycoperdon perlatum*, *Volvariella volvacea* and medicine such as *Ganoderma applanatum*., *Laetiporus sp.*, *Phellinus linteus*, *Agaricus repandum*, *Agaricus silvaticus*, *Clavaria sp*, *Coprinus sp* including mushrooms from *Ganoderma lucidum* which are sought after because of their efficacy [11].

3.2. Distribution of Mushroom

The results of the study on line one start plots one to ten via the 18 km loop trail through the Suzuki lane with an altitude of 900-1,150 m above sea level is a colline of lowland forests. The temperature at area was 20 to 26 °C. Mushrooms were often found in the region, namely Glowwing mushrooms (*Mycnena luxaeterna*), *Ganoderma sp* and *Cortinarius sp* and *Agaricus bisporus*. *Agaricus bisporus* mushrooms, can be consumed by cooking. The distribution of Mushrooms in line one on the Cikaniki Resort of Mount Halimun Salak National Park can be seen in Figure 3. Coordinate line one was 6°44’54.22 S - 106°32’11.33 E.

![Figure 3. Mushroom distribution on Line 1 at Cikaniki Resort](image_url)
attracts insects, including beetles, flies, wasps, and ants. Visitors to these insects seem to be good for mushrooms because they spread fungal spores around them [12].

Figure 4. Glowing mushroom in light

Figure 5. Glowing mushroom in the dark

Line 2 starts the plot eleven to twenty through Kendeng Mountain with Kendeng peak 2 (Lower mountain forest zone (submontane forest)). Second type between 1,050-1,400 m asl with temperatures between 19 to 20°C (Figure 6). Coordinate line two between 6°44’13.45 S - 106°29’40.72 E. Mushrooms found in the area were *Ganoderma applanatum*, *Ganoderma lucidum* and *Sterum ostrea*.

Figure 6. Mushroom distribution on Line 2 at Cikaniki Resort
Ganoderma mushroom is an edible and medicinal mushroom. Lingzhi mushroom (*Ganoderma lucidum*) (Figure 7) is an herbal medicine that has anti-inflammatory, hepatoprotector, hypoglycemic, hypotensive and hypolipidemic. Activity Lingzhi mushrooms contains triterpenoid compounds that have hypolipidemic activity with a synthesis inhibition mechanism cholesterol. Lingzhi mushrooms can be used as an alternative in reducing high blood lipid levels [11]. According to N. M. Djariyah [13] wood mushrooms contain substances that are beneficial to human health, ingredients from traditional medicine by the community. Mushrooms are a source of polysaccharide biologically active ingredients that are efficacious as drugs.

![Ganoderma lucidum mushroom](image1)

**Figure 7.** *Ganoderma lucidum* mushroom

Line 3 starts the twenty-one to thirty plots through the 38 km Loop Trail line and will meet the end point on Marzuki Hill. The third plot is 1,500 m above sea level with a Montana forest zone. Temperatures between 15° to 20 °C and coordinate between 6°44'23.45 S - 106°31'49.70 E. Mushrooms found in the area were *Hylaria tubacina*, *Mycena leaiana*, and *Microporus affinis*. *Mycena leaiana* mushrooms (Figure 8).

![Mushroom distribution on Line 3 at Cikaniki Resort](image2)

**Figure 8.** Mushroom distribution on Line 3 at Cikaniki Resort
Mycena leaiana mushrooms (Figure 9) produce leainafulvene orange pigments, members of a class of chemical compounds known as isoilludanes. Leainafulvene has weak antibacterial activity against Acinetobacter calcoaceticus, and has expressed cytotoxic activity against tumor cells [14].

Figure 9. Mycena leaiana Mushroom

Based on the results of the study, the distribution of Mushrooms on the Cikaniki resort spread evenly according to the temperature and humidity of the location where the Mushrooms was found. According to the research by Agustini [8] there is no significant correlation between differences in the height of locations where soil sampling and litter with the total number of microbes isolated from three national parks namely Karimun Jaya National Park with an altitude of 57-65 m above sea level, West Bali National Park with a height of 25-40 meters above sea level and Mt. Ciremai National Park with an altitude of 521-630 m above sea level. Environmental factors that affect the growth and development of Mushrooms are given by light, temperature, humidity, soil pH, nutrients and water content. The altitude factor is very closely related to the air temperature because the altitude of the place affects the temperature of the surrounding air. The higher the place, the lower the temperature and air pressure.

4. Conclusion
There were 50 types of mushrooms, 35 mushrooms known to the name of the species and 15 unknown names of mushroom. Mushrooms were used as food producers such as, Agaricus bisporus, Auricularia polytricha, Agarics, Auricularia delicate, and Tramella fuciformis, Bovista plumbea, Lycoperdon perlatum, Volvariella volvacea. Mushrooms were used as medicines such as Ganoderma applanatum, Ganoderma lucidum, Laetiporus sp., Phellinus linteus, Agaricus repandum, Agaricus silvaticus, Clavaria sp, and Coprinus sp. The distribution of Mushroom at Cikaniki Resort from an altitude 900 until 1,500 m asl. From Lowland forest colline zones until Montana forest zone. Environmental factors that affect the growth and development of Mushrooms are light, temperature, humidity, soil pH, nutrients and water content.

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