# Diversity of Mushrooms and Evaluation of Biochemical Properties of Selected Edible Mushrooms in Pallikkal Village, Malappuram District, Kerala

**[1]Salini. P and [2]Saradha. M[*] and [3]Kavi Malar. S**

*[1]Department of Botany, Nirmala college for women, Coimbatore, Tamil Nadu, India.*

*[2]Assistant professor, Department of Botany, Nirmala college for women, Coimbatore, Tamil Nadu, India.*

*[3]Ph. D., Research Scholar Department of Botany, Nirmala college for Women, Coimbatore-641018. Tamil Nadu, India.*

*Email – [1]saliniiputhiyedath@gmail.com, [2*]saradhabio@gmail.com and [3]kavimalarsuren@gmail.com.*

## *Abstract*

*The study was carried out to document the mushrooms in Pallikkal village, Malappuram, Kerala and to analyse the preliminary phytochemical and biochemical constituents of Agaricus bisporus, Pleurotus ostreatus and Lentinus squarrosulus. The qualitative phytochemical analysis in methanolic extract was carried out to screen the presence of primary and secondary metabolites using the standard procedures. The edible mushrooms of Agaricus bisporus, Pleurotus ostreatus and Lentinus squarrosulus were performed to determine the total amount of carbohydrate, protein and phenol present in the fruiting bodies. In methanolic extract the phytochemical analysis results revealed the presence of carbohydrate, protein, phenol, tannin, flavonoids, terpenoids, glycosides and steroids and the highest amount of carbohydrate (326.07 mg/g), protein (309.2 mg/g) and phenol (37.33 mg/g) were present in Agaricus bisporous.*

***Keywords**: Biochemical analysis, Mushroom, Phytochemical constituents, Documentation*

# 1. Introduction

Mushrooms are increasingly being consumed by people throughout the world due to their nutritive and medicinal values. There are more than 2,000 species of mushrooms found in nature, but only 25 are used as food, and few are commercially cultivated in the world [10]. Nowadays edible mushrooms are considered as an important remedy for treatment of various illnesses. Infusion of mushrooms has been used to help beriberi, the decoction has been used for the treatment of abscesses and injuries [17]. Many researchers have been reported that edible mushrooms are remedial foods for the various ailments like antibacterial, anticancer, antiviral conditioning, antioxidant parcels in which edible mushrooms are rich sources of nutraceuticals [6,13]. Mushroom Nutraceuticals are amended food accoutrements which are used for Conservation of healthy diet [3,14].

*Agaricus bisporus, Pleurotus ostreatus,Lentinus squarrosulus* are widely cultivated and nutritionally rich macrofungi. Nutritionally these mushrooms have been analysed to have protein, carbohydrate, fat, salutary fibre, vitamin B2, vitamin C, Iron and ash content [8,10,11]. *L. squarrosulus* is also employed in the treatment of common conditions similar as cough, fever, and fungal infections, while *L. squarrosulus* is largely appreciated in Thailand because of its restorative and tonic characteristics[15,16]. Hence this present study will help to understand the phytochemical and biochemical quantification of *Agaricus bisporus, Pleurotus ostreatus* and *Lentinus squarrosulus* that will be used for daily intake of human diet.

# 2. Materials and methods

### 2.1 Study Area

The survey of wild mushroom was conducted in Pallikkal village, Malappuram district, Kerala. Perched on the Western slopes of the Malappuram district.

### 2.2 Data Collection

Extensive and repeated field survey was carried out during June-December 2021. Information about medicinal uses of the mushrooms was collected from the local people residing the locality. The taxonomic identify of the mushrooms was confirmed. The information about botanical name, family, habitat, edibility, poisonous or no- poisonous, medicinal uses were given table 1.

## 2.3 Preliminary Phytochemical Analysis and Biochemical Estimation

### Sample Collection

Fresh fruiting bodies of edible mushroom were collected during june to December 2021 in and around, Pallikkal village, Malappuram district,kerala. The fresh fruiting bodies of the mushroom were washed and shade dried for 30 days.

### Preparation of the sample for extract

15grm of powdered mushroom was measured and mixed with 100ml of methanol. Then the extraction was carried out by shaker for 72 hours. The extract obtained was stored in screw cap bottle in refrigerator for further study.

## Qualitative and Quantitative Analysis

Phytochemical screening was performed to assess the various phytoconstituents like Carbohydrate, protein, phenol, tannin, saponin, glycosides, steroids, terpenoids, alkaloids present in methanolic exatract of *Agaricus bisporus*, *Lentinus squarrosulus*, *Pleurotus ostreatus*, by using the standard procedures[17,8,2]. The quantification of Carbohydrate, Protein and Phenol were done by using Anthrone reagent, Lowry's and Follin-ciocalteau method by using the standard procedure [13].

## 3. Results and Discussion

**Table: 1 Documentation of Mushrooms from Pallikkal village, Malappuram district, Kerala**

| S.No | Botanical name | Family | Habitat | Edibility | Poisonous/ not | Medicinal use |
|---|---|---|---|---|---|---|
| **1** | ***Agaricus bisporus*** (J.E. Lange) | Agaricaceae | Soil | Edible | Non poisonous | Stomach problems |
| **2** | ***Coprinellus disseminates*** (Pers.) J.E. Lange | Psathyrellaceae | Decaying wood | unknown | Non poisonous | Control sugar. |
| **3** | ***Coprinopus lagopus*** Fr. | Psathyrellaceae | Wood chips | Inedible | Non poisonous | Lack of information |
| **4** | ***Daedalea flavida*** Lev. | Fomitopsidaceae | Decaying wood | Inedible | Poisonous | Treatment of cancer. |
| **5** | ***Daldinia concentrica*** (Bolton) Cesati & Notaris | Hypoxylaceae | Decaying wood | Inedible | Poisonous | Skin diseses |
| **6** | ***Dictyophora indusiasta*** (Vent.) Fisch. | Phallaceae | soil | Edible | Non poisonous | Stomach disorders |
| **7** | ***Ganoderma boninense*** | Polyporaceae | Decaying wood | Inedible | Poisonous | Malarial diseases |
| **8** | ***Geastrum triplex*** Jungh | Geastraceae | humus | unknown | Non poisonous | To treat Inflammatory diseases |
| **9** | ***Lactocollybia epia*** (Berk. | Marasmiaceae | soil | Inedible | Poisonous | Lack of information |

| | | | | | | |
|---|---|---|---|---|---|---|
| | & Broome) Pegler | | | | | |
| **10** | ***Lentinus tigrinus*** (Bull.) Fr | Polyporaceae | Decaying wood | Edible | Non poisonous | Effective against bacteria and fungal diseases |
| **11** | ***Leucoagaricus meleagris*** (Gray) Singer | Agaricaceae | Decaying wood | Edible | Non poisonous | Lack of information |
| **12** | ***Macrolepiota albuminosa*** (Berk.) Pegler | Agaricaceae | Soil | Edible | Non poisonous | Blood and bowel cancer |
| **13** | ***Peziza vesiculosa*** Bull. | Pezizaceae | Animal dung | Inedible | Poisonous | Has antitumor effect |
| **14** | ***Pleurotus ostreatus*** (Jacq. Ex Fr.) P. Kumm. | Pleurotaceae | Decaying wood | Edible | Non poisonous | Antimicrobial and anti-diabetic activity |
| **15** | ***Pluteus plautus*** (Weinm.) Gillet | Pluteaceae | Decaying wood | Inedible | Unknown | Aesthetic purposes |
| **16** | ***Termitomyces microcarpus*** (Berk& broome) R. Heim | Lyophyllaceacea | Soil | Edible | Non poisonous | Neurodiseases |
| **17** | ***Tremella fuciformis*** Berk. | Tremellaceae | Decaying wood | Edible | Non poisonous | Heart diseases |
| **18** | ***Volvariella murinella*** (Quel.) | Pluteaceae | Bark | Inedible | poisonous | Act as an Immune raising |
| **19** | ***Lentinus edodes*** | Marasmiaceae | Decaying wood | edible | Non poisonus | Reduces blood pressure |

The survey conducted during June - december 2021 in Pallikkal village, Malappuram district Kerala. The survey deals with 19 species belonging to 14 families, among the families Agaricaceae, *Agaricus bisporous, Leucoagaricus meleagris, Macrolepiota albuminosa* were the three fruiting bodies that were dominating in the Pallikkal village. The diversity of mushrooms in the foot hill of Western Ghats-a study from the eastern part of Malappuram, Kerala, in the study 90 macrophages from 30 families were observed and maximum occurrence during the wet season[4]. Habitat of mushroom was recorded and most of the mushroom habit were found on decaying wood (10), followed by soil (5), (1) on the bark of the tree, (2) humus, wood chips animal dung are having single species in the study area. Many mushroom species are poisonous to humans with toxicities ranging from slight digestive problems or allergic reactions as well as hallucinations to severe organ failures and death[5]. In the present documentation study the poisonous and non poisonous (7) fruiting bodies were recorded (7) species of fruiting bodies also recorded to be found as edible and (9) species of fruiting bodies were documented as non-edible for (3) species the status of consumability was not yet evaluated.

Many fresh mushroom contain least amount of fat so they can be given to patients suffering from hypolipideamia (high blood lipids) and hyperchloresterolema (high blood cholesterol). They have less carbohydrates so they are believed to be suitable for diabetic patients. The mushroom *Lentinus edodes* has antitumour property as well as antiviral property and the properties are due to the presence of lentinanus and emitanin-1 in the mushroom as, it reduces the high blood pressure, gall stones and numbness of hands and feet. At the time of documentation the poisonous mushrooms looks like edible mushroom in their morphology and life cycle. However, they can be distinguished by bright coloured fruit bodies, greenish tinge on gills, yellow-green spores, pink coloured spores in gills, presence of vulva and annulus on the stalk, oozing of milky or coloured latex from damaged portions and unpleasant odour. Moreover a single fruiting body of *Agaricus bisporus* is used for cancer, type 2 diabetes, high cholesterol, hardening of the arteries (arteriosclerosis), ongoing liver disease, bloodstream disorders, and digestive problems. And the other uses including the prevention of heart disease, weakened bones (osteoporosis), and stomach ulcers. *Tremella fusiformis* was documented to inhibit the development,spread of inflammation and could therefore be a potential treatment for inflammation-related diseases such as heart disease, obesity, and tumours. *Pleurotus ostraoeatu* and *Marcolepiota albuminosa* was recorded to have antidiabetic, antibacterial, anticholestrolic, antiarthritic, antioxidant, anticancer, eye health and antiviral activities. Hence this documentation of Mushrooms will also help in planning for conservation of endemic and threatened fruiting bodies and may also provide a suitable starting point for further comprehensive studies and also brief about the traditional remedies using mushroom for treating various ailments and diseases as illustrated in the table:1.

Fruit bodies are derived from different habitats, such as soil, fresh bark, rotten wood, animal dung, humus, burnt leaves, compost, etc. Some of them were edible but most were non edible. The macro fungal diversity in various districts of the state Nagaland a total of 87 species of wild mushrooms were collected and identified[1].

## Qualitative phytochemical analysis

The qualitative preliminary phytochemical analysis of methanolic extraction in dried samples of *Agaricus bisporus* , *Pleurotus ostreatus* , *Lentinus squarrosulus* were performed to confirm the presence of secondary metabolites. The results revealed the presence of carbohydrate, protein, phenol, tannin, flavonoid, terpenoid, glycoside and steroid in *Agaricus bisporus, Pleurotus ostreatus* and *Lentinus squarosulus*. The highest amount of carbohydrate and protein were present in *Agaricus bisporus, Pleurotus ostreatus* and *Lentinus squarrosulus*, whereas saponin and alkaloids were absent in *Agaricus bisporus*, *Pleurotus ostreatus* and *Lentinus squarrosulus.* Similarly [5] evaluated and interpreted that the mushroom has act as a primary and secondar metabolites of protein, carbohydrate, amino acids, phenols, flavonoids, tannins, alkaloids and vitamin A, C and E.

**Table 2: Showing the Phytochemical composition of methanolic extracts of edible**

| Sl.No | Phytochemical constituents | *Agaricus bisporus* | *Pleurotus ostreatus* | *Lentinus squarrosulus* |
|---|---|---|---|---|
| **1.** | Carbohydrate | +++ | ++ | ++ |
| **2.** | Protein | +++ | +++ | ++ |
| **3.** | Phenol & Tannin | ++ | + | + |
| **4.** | Flavonoids | + | ++ | + |
| **5.** | Saponins | - | - | - |
| **6.** | Glycosides | ++ | + | - |
| **7.** | Steroid | + | + | - |
| **8.** | Terpenoid | ++ | + | - |
| **9.** | Alkaloid | - | - | - |

## Quantitative phytochemical analysis

Biochemical estimation of carbohydrate, protein and phenol of *Agaricus bisporus, Pleurotus ostreatus and Lentinus squarrosulus* were determined and the results revealed that the highest amount of carbohydrate was present in *Pleurotus ostreatus* (609.7 mg/g) when compared to *Agaricus bisporus* (326.07 mg/g) and *Lentinus sqarrosulus (87.42)*. Similarly the highest amount of protein was present in *Pleurotus ostreatus* (331.64 mg/g) when compared to *Agaricus bisporus* (309.2 mg/g) and *Lentinus squarrosulus* (17.12 mg/g). The highest amount of phenol was present in (39.89mg/g) when compared to *Agaricus bisporus* (37.33mg/g) and *Lentinus squarrosulus* (33.77 mg/g). The Mushrooms are very useful for vegetarians as they contain essential amino acids, which are generally found in animal proteins[4]. The protein estimation can be obtained from the sum of the different amino acids expressed as percentage of dry or wet samples[11].

**Table 3: Showing the total amount of carbohydrate, protein and phenol present in the dried sample of *Agaricus bisporus, Pleurotus ostreatus, Lentinus squarrosulus***

| Sl. No | Biochemical constituents | *Agaricus bisporus* | *Pleurotus ostreatus* | *Lentinus squarrosulus* |
|---|---|---|---|---|
| 1 | Carbohydrate (mg GLC/gm) | 326.07 | 609.7 | 87.42 |
| 2 | Protein(mg BSA/gm) | 309.2 | 331.64 | 17.12 |
| 3 | Phenol(mg GAE/gm) | 37.33 | 39.89 | 33.77 |

## Conclusion

The data obtained from this research clearly shows that wild mushrooms contain phytochemical compounds that are necessary for a healthy body. Hence this study will give a clear idea about the diversity and habitat of mushroom, edible, inedible, poisonous, non-poisonous mushrooms. The medicinal uses of mushroom will help to treat various ailments by local people residing in Pallikkal village, Malappuram.

## References

[1] *Ao, T., Seb, J., Ajungla, T., & Deb, C. R. (2016). Diversity of wild mushrooms in Nagaland, India. Open Journal of Forestry, 6(5), 404-419.*

[2]. *Brindha P, Sasikala B, and Purushothaman K.K. BMEBR, 1991, 3(1):84-96.*

[3]. *Chang, S.T.; Miles, P.G. (2004) Mushrooms: Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact. 2nd ed.; CRC Press: Boca Raton; 2-46.*

[4]. *Deena meria jose,Niharika johney,(2017) diversity of mushrooms in the foothill of western ghats a study from the eastern part of malapuram,kerala ,international journal of scientific research 6(7).*

[5]. *Devi, M. R., & Krishnakumari, S. (2015). Quantitative estimation of primary and secondary metabolites in hot aqueous extract of Pleurotus sajor caju. Journal of Pharmacognosy and Phytochemistry, 4(3), 198.*

[6]. *Garcia-Lafuente A, Moro C, Villares A, Guillamón E, Rostagno MA, D'Arrigo M, Martínez JA (2011), Mushrooms as a source of anti-inflammatory agents. Am J Community Psychol. 48: 125–141.*

[7]. *Ghorai, S., Banik, S. P., Verma, D., Chowdhury, S., Mukherjee, S., & Khowala, S. (2009). Fungal biotechnology in food and feed processing. Food research international, 42(5-6), 577-587.*

[8]. *Harborne JB. Phytochemical Methods. London: Chapman and Hall. 1998.*

[9]. *Jarvis, M. C., Miller, A. M., Sheahan, J., Ploetz, K., Ploetz, J., Watson, R. R., ... & Orr, B. (2004). Edible wild mushrooms of the Cofre de Perote region, Veracruz, Mexico: An ethnomycological study of common names and uses. Economic Botany, 58(1), S111-S115.*

[10]. *Kanchi, S.; Inamuddin; Khan (2020) Biogenic Synthesis of Selenium Nanoparticles with Edible Mushroom Extract: Evaluation of Cytotoxicity on Prostate Cancer Cell Lines and Their Antioxidant, and Antibacterial Activity. Biointerface Research in Applied Chemistry , 6629-6639.*

[11]. *Manzi, P., Gambelli, L., Marconi, S., Vivanti, V., & Pizzoferrato, L. (1999). Nutrients in edible mushrooms: an inter-species comparative study. Food chemistry, 65(4), 477-482.*

[12]. *Poompouang S, Suksomtip M. Isolation and characterization of an antifungal peptide from fruiting bodies of edible mushroom Lentinus squarrosulus Mont. Malays J Microbiol. 2016;12:43–49*

[13]. *Sadasivam, S., & Manickam, A. (1996). Peroxidase. Methods in Biochemistry. New Age International: New Delhi, 108-110.*

[14]. *Schillaci D, Arizza V, Gargano ML, Venturella G (2013). Antibacterial activity of mediterranean oyster mushrooms, species of genus pleurotus (higher basidiomycetes) Int J Med Mushrooms, 15,591–594.*

[15]. *Shiuan, C. (2004). Anticancer activities of white button mushrooms. Journal of Nutrition Bethesda, 134(12S), 3532S-3533S.*

[16]. *Trease GE, Evans WC. Pharmacognsy. Macmillian Publishers, 1996: 11th edn.832.*

[17]. *Venkatachalapathi A, Paulsamy S (2016). Exploration of wild medicinal mushroom species in Walayar valley, the Southern Western Ghats of Coimbatore District Tamil Nadu. Mycosphere. 7:118–130.*

[18]. *Yu, S., Weaver, V., Martin, K., & Cantorna, M. T. (2009), Effect of whole mushrooms during inflammation BMC Immunology Journal, 10-12.*