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In vitro evaluation of bioactive compounds of wild mushroom species from West Bengal

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Abstract

The fungal species or variety of different fungi and their natural habitats occupy prime place in the world biological diversity and India has been a cradle for such fungi. Wild mushrooms are comparatively rich in proteins and carbohydrates but they have content low amount of fat and no cholesterols (Gargano *et al*., 2017). In this present study, bioactive estimation of five isolates of wild mushroom species was evaluated. Among the collected isolates, protein and carbohydrates content per 100g.dw of isolate 1 (*Termitomyces heimii* - family: *Lyophyllaceae*) (Haringhata forest) and isolate 2 (*Volvariella volvaceae* – family: *Pluteceae*) (Hijuli forest, Ranaghat) had found highest amount of protein *viz*., 43.28g and 42.53g, and carbohydrates *viz*., 47.66g and 47.31g while other studied species were lower protein and carbohydrates content, with isolate 3 (*Schizophyllum commune* -family: *Schizophyllaceae*) (Santuri forest, Purulia) showing the lowest amount of protein and carbohydrates contents *viz*., 16.87g and 21.12g followed by isolate 4 (*Pleurotus ostreatus* - family: Pleurotaceae) (Bibhutibhusan forest, N-24 Parganas) *viz*., 39.20g and 42.16g, and isolate 5 (*Agaricus bisporus* -family: Agaricaceae) (Ausgram forest, Purba Bardhaman) found 19.38g and 22.79g respectively. Among the five collected species of wild mushroom, isolate 1 (*Termitomyces heimii*) and isolate 2 (*Volvariella volvaceae*) both had found the highest in terms of protein and carbohydrates concentration. Thus, isolate 1 and isolate 2 could be used as an easily accessible source of nutritional components as a possible food supplement to the consumers or in pharmaceutical industry.

Key words: Survey, collection, extraction, wild mushrooms and nutritional attributes

Introduction

Mushrooms belong to the class Basidiomycetes and some to Ascomycetes which are a largely distributed food resource surround the globe. They are consumed due to their nutritional properties as well as their medicinal values. Moreover, they have an ideal flavor and taste and because of their nutritional value as food, they have played a key important role to improve human nutrition (Blair, *et al*., 2015). Primarily edible mushrooms are provided high amount of protein and carbohydrate source as super supplementary food in our daily life. Wild mushroom variety grown and consumption

has been preferred to cultivated species in many forest areas. Mushrrom picking in forests and grasslands as an extended part of cultural heritage has presently become a highly valuable. Knowledge of the composition and nutritional value of culinary mushrooms, particularly of wild growing ones, was limited until the last decades as compared with vegetables and medicinal mushroom species (Das *et al*., 2017).

Therefore, this study focuses on the potentiality of nutritional compounds of the most popular wild mushrooms species in West Bengal.

Materials and methods

Mushroom sample collection

The Survey was conducted to the proper timing and proper location of observations which was fully covered in 5 forest areas of West Bengal. The survey for collection and documentation of wild mushroom was conducted in different tropical moist deciduous forest areas during from July 2024 to September 2024 (Table 1; Figure 1). Five collected isolates were packed in brown paper bag and brought to the Plant Pathological laboratory, Faculty of Agriculture, JIS University for their extraction and estimation of nutritional values. The mushroom species were well cleaned with fresh water and kept at 45°C in a hot air oven for 2-3 days to get a fully dried. Each dried mushroom was ground well to a fine powder using an electronic grinder (Crompton) and then stored in refrigerator at 4˚c until further studies.

Table 1. Survey of different forest areas of West Bengal

Isolates	**Mushroom species**	**Area of collection**	**Host surface**	**Colour of fruiting bodies**	**GPS Location**
Isolate 1	*Termitomyces heimii*	Haringhata forest, Nadia	Soil	Grey to off white	22˚57'37.8360″N, 88˚34′2.6616E
Isolate 2	*Volvariella volvaceae*	Hijuli forest, Ranaghat	Paddy Straw	Grey	23.1842N, 88.5775E
Isolate 3	*Schizophyllum commune*	Santuri forest, Purulia	Tree Stump	Off white	23.5230051°N, 86.8671175°E
Isolate 4	*Pleurotus ostreatus*	Bibhutibhusan forest, N-24 parganas	Tree Stump	White	23.1861775°N, 88.7620868°E
Isolate 5	*Agaricus bisporus*	Ausgram forest, Purba Bardhaman	Soil	Milky white	23˚31'04"N, 87˚39'37"E

Termitomyces heimii

Volvariella

um commune

Pleurotus ostreatus

Agaricus bisporus

Figure 1. Mushroom fruiting bodies collected from forest areas

Determination of nutritional properties

Estimation of total protein

The estimation of total protein content was defined by the method of Lowry *et al*., 1951. Poured 100 µL of aqueous extract supernatant solution in a test tube and make up with 1000 µL with dH_2O (900 µL). 5 ml of alkaline copper solution was added to each tube after wait for 10 minutes then added 0.5 ml of Folin-Ciocalteu Reagent (FCR) and incubated at room temperature for 30 minutes in dark condition. Then absorbance was measured at 660 nm using UV-VIS spectrophotometer 118 (SYSTRONICS). All test analysis data were recorded as an average of triplicate analyses.

Estimation of total carbohydrate

The carbohydrate content was determined by anthrone reagent method Masuko *et al*., 2005. About 200 mg of anthrone reagent was dissolved in 100 ml of ice cold 95 % H_2SO_4. About 100 mg of dried fine powdered sample was taken in a test tube then hydrolysed in 5ml of 2.5 N HCL by keeping it in a boiling water bath for three hours. Finally the absorbance was recorded at 630 nm against a blank using UV-VIS spectrophotometer 118 (SYSTRONICS). All test data were performed as an average of triplicate analyses.

Statistical analysis

The statistical analyses of the results were carried out as mean ± SD, and the experimental analyses were conducted at least three times in parallel. Using an ANOVA test, the difference between the mean values was computed, and values of $p < 0.05$ were considered statistically significant.

Results

Biochemical Analysis of Dried Mushroom Extracts

We estimated the total protein and carbohydrates through comparative analyses (Table 2; Figure 2). This study revealed evidenced variations among the test mushroom extracts. *Termitomyces heimii* and *Volvariella volvaceae* extract showed the significant content of protein and carbohydrate followed by *P. ostreatus*. However, *P. ostreatus* have comparatively higher protein and carbohydrate contents than *Agaricus bisporus*, while *Schizophyllum commune*, which has a relatively low protein and carbohydrate level.

Table 2. Biochemical compound analysis of the collected wild mushroom extracts

Isolates	Mushroom species	Total Protein (g/100g.dw)	Total Carbohydrates (g/100g.dw)
Isolate 1	*Termitomyces heimii*	43.28 ± 0.03^{a}	47.66 ± 0.14^{a}
Isolate 2	*Volvariella volvaceae*	42.53 ± 0.22^{ab}	47.31± 0.15^{a}
Isolate 3	*Schizophyllum commune*	16.87 ± 0.15^{e}	21.12± 0.23^{c}
Isolate 4	*Pleurotus ostreatus*	39.20 ± 0.2^{abc}	42.16± 0.03^{ab}
Isolate 5	*Agaricus bisporus*	19.38 ± 0.23^{d}	22.79± 0.04^{b}

In each column different letters as mean ± SD of three replicates (n = 3), statistically significant differences between samples ($p < 0.05$, DMR test).

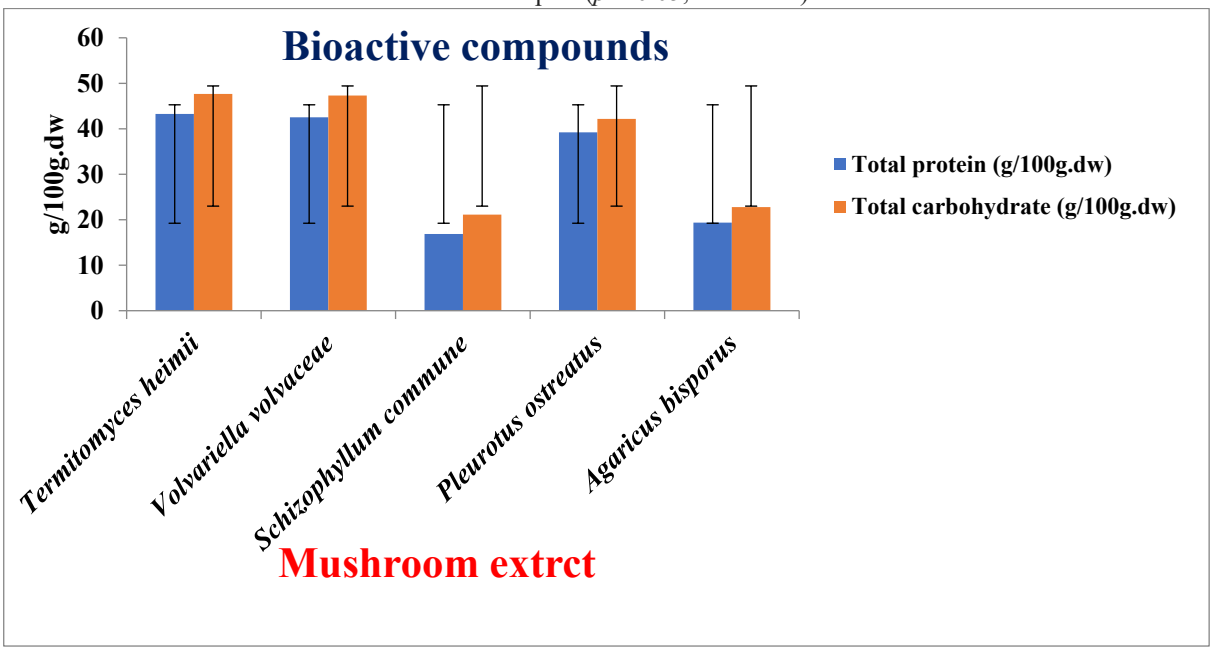

Figure 2. Bioactive components activity of different wild mushroom extracts

Discussion

In this study, we reported the potentiality of two different nutritional activities such as protein and carbohydrates of the five collected wild mushroom isolates. The quantity of immune-modulating proteins found in edible fruiting bodies is enormous (Ahmed *et al*., 2023). Researcher have conducted that highest amount of protein contents of mushroom species were found in *Termitomyces heimii* (41.73 g/100g of dry weight), and lowest amount of protein contents in *Volvariella volvacea* (36.43 g/100g of dry weight) (Kumari *et al*., 2020).

Our findings regard to the relatively high amount of carbohydrates content recorded in the samples such as *Termitomyces heimii*, *Volvariella volvaceae* and *Pleurotus ostreatus* than that of *Schizophyllum commune* and *Agaricus bisporus* (Table 2; Figure 2). The researchers have investigated that the edible mushroom species, like that *Lentinus sajor-caju* showed the highest amount of carbohydrate contents (49.80 g/100g d.w.), followed by *Polyporus arcularius* (46.64 g/100g of d.w.), *Lentinus squarrosulus* (46.36 g/100 g d.w.) and *Auricularia auricula-judae* (42.75 g/100 g d.w.) (Kakoti *et al*., 2021).

Conclusion

According to the results of the present study, five mushrooms extracts such as *Termitomyces heimii*, *Volvariella volvaceae*, *Schizophyllum commune*, *Pleurotus ostreatus*, and *Agaricus bisporus* are abundant and reasonably priced suppliers of protein and carbohydrates. Thereby, they could help in improving the well fitness of health through reducing of many harmful diseases like joint inflammation and oxidative stress; protect brain health, liver chronic, high cholesterol, lung diseases and cancer etc. Consequently, more research is needed to separate, recognize, and refine the noteworthy new bioactive elements, and a thorough pathway analysis is being looked into. In order to highlight the therapeutic potential of *Termitomyces heimii* and *Volvariella volvaceae* mushrooms as a source of the pharmaceutical and nutraceutical industry usages in large scale, and clinical research could be recommended as nutritional properties as a possible food supplements.

References

Ahmed, A. F., Mahmoud, G. A. E., Hefzy, M., Liu, Z., & Ma, C. (2023). Overview on the edible mushrooms in Egypt. *Journal of Future Foods*, *3*(1), 8-15.

Blair, A., Ritz, B., Wesseling, C., & Freeman, L. B. (2015). Pesticides and human health. *Occupational and Environmental Medicine*, *72*(2), 81-82.

Das, A. R., Saha, A. K., Joshi, S. R., & Das, P. (2017). Wild edible macrofungi consumed by ethnic tribes of Tripura in Northeast India with special reference to antibacterial activity of Pleurotus djamor (Rumph. ex Fr.) Boedijn. *International Food Research Journal*, *24*(2).

Gargano, M.L., van Griensven, L.J., Isikhuemhen, O.S., Lindequist, U., Venturella, G., Wasser, S.P. & Zervakis, G.I. (2017). Medicinal mushrooms: Valuable biological resources of high exploitation potential. *Plant Biosystems-An International Journal Dealing with all Aspects of Plant Biology*, *151*(3), 548-565.

Kakoti, M., Hazarika, D.J., Parveen, A., Dullah, S., Ghosh, A., Saha, D., Barooah, M. & Boro, R.C. (2021). Nutritional Properties, Antioxidant and Antihaemolytic Activities of the Dry Fruiting

Bodies of Wild Edible Mushrooms Consumed by Ethnic Communities of Northeast India. *Polish Journal of Food and Nutrition Sciences*, *71*(4), 463-480.

Lowry, O. H. (1951). Protein measurement with the Folin phenol reagent. *J biol Chem*, *193*: 265-275.

Masuko, T., Minami, A., Iwasaki, N., Majima, T., Nishimura, S. I., & Lee, Y. C. (2005). Carbohydrate analysis by a phenol–sulfuric acid method in microplate format. *Analytical biochemistry*, *339*(1), 69-72.