J. Appl. Biosci., 50(2): 194-196, December, 2024
doi: 10.61081/joab/50v2i117

ISSN (Print) 0975-685X
ISSN (Online) 0975-864X

ORIGINAL ARTICLE

Nutritional Evaluation of *Ganoderma lucidum* Karst Collected from Gorakhpur City of Northern Part of India

Pratima Vishwakarma[1] and Narendra Kumar[*2]
[1]Department of Botany, St. Joseph's College for Women, Civil Lines, Gorakhpur 273009, UP, India
[2]Department of Botany, Guru GhasidasVishwavidyalaya (A Central University), Bilaspur 495009, Chhattisgarh, India

ABSTRACT

Ganoderma lucidum Karstis a wood-decayingmacrofungi and has been recognized as medicinal mushroom for over 2000 years. Day by day its demand for use for medicinal purposesis increasing rapidly. *G. lucidum* is a rich source of various natural bioactive compounds which imparts its therapeutic properties, viz., antibacterial, antiviral, antifungal, anticancer, anti-inflammatory, antitumor, anti-hypotensive, and antioxidative agents. The present study aims to determine the nutrient content of *G. lucidum.* It is clear from the finding that this mushroom is rich in protein (14.28 ± 1.02%) and fibre (49.62 ± 1.21%) while lipid was found in low concentration (1.28 ± 0.31%). Other nutrient was also found in considerable amount viz., carbohydrate: 30.50 ± 1.22%, moisture: 7.50 ± 1.20%, Dry matter: 92.50 ± 1.82%, and ash: 1.98 ± 0.07%. The result clearly shows that *G. lucidum* is a rich source of nutrients and can be used as food supplements.

KEY WORDS: Ash, Carbohydrate, Lipid, Mushroom, Protein

INTRODUCTION

G. lucidum known as Lingzhi (in China), Reishi (in Japan) and Mannentake (in Korea) is regarded as one of the chief traditional medicinal mushrooms and has been used for generations. According to Greeks and Vikings, eating mushrooms provided them energy and potency before battle, while the Romans considered mushrooms in general as the meal of their gods and only served them during special feasts. Native Americans utilized mushrooms to transcend the mental and physical boundaries, generally in enchanted rites (such as magical hallucinogens) (Chang, 2006). *G. lucidum* can help to stay people healthy and also live longer, but in the past, it was considered to be source of immortality and a mixture of spiritual power (Zhao *et al.*, 2015). Because of its therapeutic qualities, in Far Eastern countries, *G. lucidum* has been used for over 2,000 years.

Various types of alkaloids, polysaccharides (α/β-D-glucans), triterpenoids (ganoderic acids, ganoderenic acids, ganoderol, ganoderiol, and lucidenic acids), proteins (LZ-8, LZ-9), sterols/ergosterol, nucleosides (adenosine, inosine, uridine), and nucleotides (guanine, adenine) are responsible to impart nutritional, cosmetic, and medicinal benefits of *G. lucidum*. It shows antidiabetes, anti-inflammation, antiepilepsy, prevent neurodegeneration, anticancerous, relief from anxiety, drowsiness, heart disease, depression, hepatic illnesses, and immunological disorders (Fig. 1) and hence exhibits therapeutic potential (Boh *et al.*, 2007; Ma *et al.*, 2015; Yuen & Gohel, 2005).

G. lucidum is known for its several health benefits and has been used in traditional medicine for a wide range of ailments. In addition to its medicinal properties, it is important to understand the nutritional value of this edible mushroom. Hence the current work is done to analyze the nutrient value of *G. lucidum* collected from Gorakhpur district.

MATERIAL AND METHODS

Sample Collection, Identification and Processing

Samples of *G. lucidum* were collected from forest regions of Gorakhpur during the months of July to August 2021-2022. The sample is identified on the basis of macroscopic and microscopic studies confirmed by relevant literature (https://www.mushroomexpert.com/ganoderma.html). The collection sites were primarily shaded, moist areas near decaying wood, fallen trees, and

*Corresponding author email: narendra.microbiology@rediffmail.com

stumps, typical of *G. lucidum* habitats. During collection, sterile gloves and equipment were used to minimize contamination. Samples were photographed, placed in sterilized collection bags, labelled properly and transported to the laboratory.

Samples were cleaned and dried in shadow at room temperature for 14 days. It was then grinded to make fine powder with the help of grinder and stored for further study.

Biochemical Assay

Moisture content was determined by direct oven drying method. The loss in weight after oven drying 2 gm of the sample at 110°C to constant weight was expressed as percent moisture content (Oyetayo *et al.*, 2007). Protein content of macrofungal samples were determined by the method of (Adedayo, 2011). Carbohydrate was estimated by Anthrone method (Thimmaiah, 1999). Crude fibre content was evaluated following (Alam *et al.*, 2008) while lipid was estimated by the method of (Gbolagade *et al.*, 2006). Ash of the sample was estimated by the method of (Liu Gang *et al.*, 2010).

RESULTS AND DISCUSSION

The biochemical analysis of *Ganoderma lucidum* conducted in this study reveals its potential as a nutrient-dense macrofungi with promising health benefits.

In present study, fiber content was found to be 49.62 ± 1.21% (Table 1), which is notably high value and aligns with previous studies done by (Lee *et al.*, 1989), who reported a similar range of 47.2-49.9%. Fibre is very important for digestive health and is also related with cholesterol reduction, and hence contains high potential in promoting cardiovascular health. Additionally, *G. lucidum* contains both soluble and insoluble fibres, mainly chitosans and β-glucans, which are generally known for their bioactive properties like immune support and cholesterol-lowering effects (Sadler, 2003).

Carbohydrates were found to be 30.50 ± 1.22% (Table 1), which seems to be with ranges previously as documented by Lee *et al.* (1989) (29.1-31.1%) and Gharib *et al.* (2022) (37.33%). Carbohydrates serve as an important energy source, which contributes its functionality in both nutritional and medicinal applications. This carbohydrate profile in *G. lucidum* aoffer energy and at the same time maintains other health benefits.

The protein content in *G. lucidum* in the present study was 14.28±1.02% (Table 1), consistent with other studies. Lee *et al.* (1989) reported protein values ranging from 15.2% to 15.6%, while Ogbe & Obeka, (2013) found little higher protein content (17.27 ± 0.35%) in *G. lucidum*. Ferreira *et al.* (2015) studied variability in concentration of protein based on geographical origin. They documented that

Table 1: Biochemical assay of *G. lucidum* (%)

Parameters	Amount (%)
Protein	14.28 ± 1.02%
Carbohydrate	30.50 ± 1.22%
Fibre	49.62 ± 1.21%
Lipid	1.28 ± 0.31%
Moisture	7.50 ± 1.20%
Dry matter	92.50 ± 1.82%
Ash	1.98 ± 0.07%

Values are means ± SEM for groups of 3 observations with their standard errors

Serbian strain of *G. lucidum* shows 11.34±1.21% of protein while Chinese strain shows a lower protein content of 9.93±0.26%. This variation in protein content based on geographical origin suggests that factors like cultivation environment, strain, and growth conditions may impact protein synthesis in *G. lucidum*, highlighting the need for standardized methods for cultivation to maximize its protein yield.

In macrofungi, the fat content is very low (4-6%) as compared to proteins and carbohydrates. Due to the low lipid content, they are suggested as respectable source of food supplements for patients with cardiac problems orat risk of lipid-induced disorders (Tripathi *et al.*, 2017). In present study, the lipid content was found to be 1.28 ± 0.31% (Table 1), which is consistent with earlier findings reporting low lipid concentrations in *G. lucidum* (Lee *et al.*, 1989; Gharib *et al.*, 2022). The low lipid profile in *G. lucidum* makes it an ideal candidate for low-calorie diets and weight management programs, as it offers minimal fat content without compromising nutritional value.

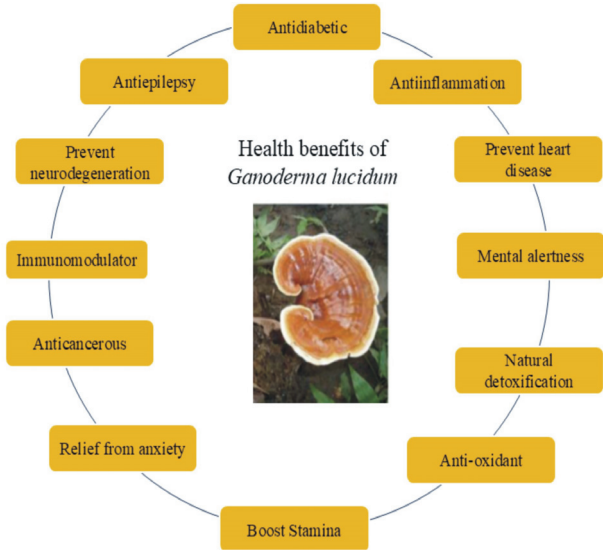

Fig. 1. Health benefits of *G. lucidum*

The ash content of *G. lucidum* in present study was found to be 1.98 ± 0.07% (Table 1), which aligns closely with findings of Gharib *et al.*, (2022), who reported 2.03% of ash in *G. lucidum* powder. The ash content denotes mineral composition within sample, which includes essential elements viz.,sulphur, phosphorus, magnesium, and trace minerals like iron,copper, and zinc (Roy *et al.*, 2015; Ahmad, 2020). These minerals are important for maintaining metabolic and physiological processes, making *G. lucidum* valuable food with respect to nutritional supplements.

The moisture content of *G. lucidum* was found to be 7.50 ± 1.20% and the dry matter to be 92.50 ± 1.82% (Table 1). These values are very helpful in increasing the shelf life of mushroom, as low moisture content reduces the risk of microbial contamination and extends the product's usability. Low moisture also contributes to a concentrated nutrient profile, which is desirable in nutraceutical applications.

The rich nutritional profile of *G. lucidum*, mainly its high protein and fibre content, boosts its value as a functional food ingredient with high probable applications in dietary and health supplements (Sadler, 2003; Zhang *et al.*, 2018).

CONCLUSION

The biochemical profile of *G. lucidum* clearly shows its high potential as a valuable dietary supplement and functional food ingredient, chiefly due to its high protein, fibre, and carbohydrate content and low-fat profile. The current research findings confirm its consistent nutritional value and also highlight the need for further research to enhance growth conditions and selection of thestrain for enhanced nutrient synthesis, which could expand *G. lucidum*'s applications in nutraceuticals and functional foods.

REFERENCES

Adedayo, M.R. (2011). Proximate analysis on four edible mushrooms. *J. App. Sci. Environ. Manag.*, 15(1).

Ahmad, M.F. (2020). Ganoderma lucidum: A rational pharmacological approach to surmount cancer. *J. Ethnopharma.*, 260: 113047.

Alam, N., Amin, R., Khan, A., Ara, I., Shim, M.J., Lee, M.W., & Lee, T.S. (2008). Nutritional Analysis of Cultivated Mushrooms in Bangladesh-Pleurotus ostreatus, Pleurotus sajor-caju, Pleurotus florida and Calocybe indica. *Mycobiol.*, 36(4): 228. https://doi.org/10.4489/myco.2008.36.4.228

Boh, B., Berovic, M., Zhang, J., & Zhi-Bin, L. (2007). Ganoderma lucidum and its pharmaceutically active compounds (pp. 265-301). https://doi.org/10.1016/S1387-2656(07)13010-6

Chang, S.-T. (2006). The World Mushroom Industry: Trends and Technological Development. *Intern. J. Medi. Mushr.*, 8(4): 297-314. https://doi.org/10.1615/IntJMedMushr.v8.i4.10

Ferreira, I.C.F.R., Heleno, S.A., Reis, F.S., Stojkovic, D., Queiroz, M.J.R.P., Vasconcelos, M.H., & Sokovic, M. (2015). Chemical features of Ganoderma polysaccharides with antioxidant, antitumor and antimicrobial activities. *Phytochem.*, 114: 38-55.

Gbolagade, J., Ajayi, A., Oku, I., & Wankasi, D. (2006). Nutritive value of common wild edible mushrooms from southern Nigeria. *Global J. Biotechnol. Biochem.*, 1(1): 16-21.

Gharib, M. A.-A., Elhassaneen, Y.A.E.E., & Radwan, H. (2022). Nutrients and nutraceuticals content and in vitro biological activities of reishi mushroom (Ganoderma lucidum) fruiting bodies. *Alexandria Sci. Exch. J.*, 43(2): 301-316.

Lee, S.-K., Yoo, Y.-J., & Kim, C.-S. (1989). Studies on the chemical components in Ganoderma lucidum. *Korean J. Food Sci. Technol.*, 21(6): 890-894.

Liu Gang, L.G., Wang Hui, W.H., Zhou BenHong, Z.B., Guo XianXi, G.X., & Hu XianMing, H.X. (2010). Compositional analysis and nutritional studies of Tricholoma matsutake collected from Southwest China.

Ma, H.-T., Hsieh, J.-F., & Chen, S.-T. (2015). Anti-diabetic effects of Ganoderma lucidum. *Phytochem.*, 114: 109-113. https://doi.org/10.1016/j.phytochem.2015.02.017

Ogbe, A.O., & Obeka, A. D. (2013). Proximate, mineral and anti-nutrient composition of wild Ganoderma lucidum: Implication on its utilization in poultry production.

Oyetayo, F.L., Akindahunsi, A.A., & Oyetayo, V.O. (2007). Chemical profile and amino acids composition of edible mushrooms Pleurotus sajor-caju. *Nutri. Heal.*, 18(4): 383-389.

Roy, D.N., Azad, A.K., Sultana, F., Anisuzzaman, A.S.M., & Khondkar, P. (2015). Nutritional profile and mineral composition of two edible mushroom varieties consumed and cultivated in Bangladesh. *The J. Phytopharm.*, 4(4): 217-220.

Sadler, M. (2003). Nutritional properties of edible fungi. *Nutr. Bull.*, 28(3).

Thimmaiah, S.K. (1999). Carbohydrates. Standard Methods for Biochemical Analysis. Kalyani Publishers, New Delhi, India, 55-57.

Tripathi, N.N., Singh, P., & Vishwakarma, P. (2017). Biodiversity of macrofungi with special reference to edible forms: a review. *The J. Ind. Botan. Soc.*, 96(3&4): 144-187.

Yuen, J.W.M., & Gohel, M.D.I. (2005). Anticancer Effects of Ganoderma lucidum: A Review of Scientific Evidence. *Nutri. Cancer*, 53(1): 11-17. https://doi.org/10.1207/s15327914nc5301_2

Zhang, H., Jiang, H., Zhang, X., & Yan, J. (2018). Amino acids from Ganoderma lucidum: Extraction optimization, composition analysis, hypoglycemic and antioxidant activities. *Curr. Pharmac. Anal.*, 14(6): 562-570.

Zhao, X.-R., Huo, X.-K., Dong, P.-P., Wang, C., Huang, S.-S., Zhang, B.-J., Zhang, H.-L., Deng, S., Liu, K.-X., & Ma, X.-C. (2015). Inhibitory effects of highly oxygenated lanostane derivatives from the fungus Ganoderma lucidum on P-glycoprotein and á-glucosidase. *J. Nat. Prod.*, 78(8): 1868-1876.