Research Article

Proximate analysis, phytochemical screening and antioxidant activity of different strains of Ganoderma lucidum (Reishi Mushroom)

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Abstract

In this study, proximate analysis, phytochemical screening and antioxidant activity of two strains of medicinal mushroom Ganoderma lucidum (arbitrarily named strain 5 and 7) and their mix, cultivated in Bangladesh National Mushroom Development Institute, have been determined. The mix was used to determine whether it contains higher nutritive value than strain 5 and 7 alone. Protein content per 100 gm of strain 5, 7 and mix had been found to be 278.85mg, 298.69mg, and 286.19mg, respectively. Lipid content estimated were 2.43gm, 1.96 gm and 2.4gm, respectively, while that of ash were 4.42 gm, 6.11gm and 3.93gm, respectively. *Corresponding author: Mohammad Azizur Rahman, Department of Biochemistry and Molecular Biology, Jahangirnagar University, Savar, Dhaka 1342, Bangladesh, E-mail: azizunb@jnuiv.edu

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Introduction

Ganoderma lucidum, a medicinal macrofungi, has been hailed in the orient since ancient times [1]. Content of numerous bio-components has allured this mushroom globally [2]. The last decade has witnessed G. lucidum – based pharmaceuticals, cosmetics and toiletries. These are produced from different parts of the mushroom, including mycelia, spores, and fruit body. The specific applications and attributed health benefits of G. lucidum include control of blood glucose levels, modulation of the immune system, hepatoprotection, bacteriostasis, and more. Though beliefs regarding the health benefits of are based largely on anecdotal evidence, traditional use and cultural mores, recent reports provide scientific support to some of the ancient claims of the health benefits of G. lucidum [3]. More extensive study is called for elucidating the health benefits provided by this mushroom especially for the ever increasing food and nutrition oriented therapeutic purposes. In this regard, proximate analysis and phytochemical screening of G. lucidum spur high.

Oxidative stress (OS) stands at the root of multiple diseases. Thus, search for potent antioxidant has got momentum. Ganoderma lucidum has been reported possessing antioxidant prowess of different sorts. Its antioxidant capacity varies from strain to strain even from parts to parts of the same strain. There is hardly any study reporting the proximate analysis, phytochemical screening and antioxidant studies of different strains and mix of different strains of this mushroom. Thus, the present study has been aimed at elucidating these unraveled issues of two strains named arbitrarily as 5 and 7 of G. lucidum and their mix.

Materials and methods

Mushroom collection and preparation

Fruiting bodies of G. lucidum were collected from Bangladesh.
Following the procedure established by the Association of Official Analytical Chemists (AOAC), the analyses were performed [5]. Analyses included the determination of crude protein, crude fat, ash, crude fiber, moisture and carbohydrate. The percentage of all the fractions (crude protein, crude fat and ash) were added together and subtracted from 100 to obtain the total carbohydrate percentage.

Antioxidant studies

I. Qualitative screening for antioxidant activity

Determination of phenols (Ferric chloride test)

Following the method of Soloway and Wilen (1952) [6], ferric chloride test was performed to assess the phenolics in the HWE of G. lucidum.

Determination of flavonoids (Alkaline reagent test)

Following the method of Rahman, et al. (2017) [7], Alkaline reagent test was performed to assess the flavonoids in the HWE of G. lucidum.

Determination of ascorbic acid

Following the method of Schmall and Pifer (1953) [8], HWE of G. lucidum was assessed for the presence of ascorbic acid.

II. Quantitative estimation of phytochemical constituents

Total phenolics content (TPC) assay

Following the modified method of Singleton, et al. (1999) [9], content of total phenolics in the HWE of G. lucidum was performed.

Total flavonoid content (TFC) assay

Following the modified method of Chang, et al. (2002) [10], content of total flavonoids in the HWE of G. lucidum was performed.

Ascorbic acid content assay

Following the modified method of Omaye, et al. (1979) [11], content of ascorbic acid in the HWE of G. lucidum was performed.

Total protein content assay

Following the modified method of Lowry, et al. (1951) [12], content of total protein in the HWE of G. lucidum was performed.

Reducing sugar content assay

Following the modified method of Nelson–Somogyi (1944) [13], content of reducing sugar in the HWE of G. lucidum was performed.

Antioxidant assay

Ferric reducing antioxidant power (FRAP) assay

Following the modified method of Benzie and Strain (1996) [14], ferric reducing antioxidant power (FRAP) assay of the HWE of G. lucidum was performed.

DPPH(1,1-diphenyl–2–picryl–hydrazyl) Free radical scavenging activity assay

The ability of the HWE of G. lucidum to scavenge 2,2-diphenyl-1–picrylhydrazyl (DPPH) free radicals was determined according to the method Brand–williams (1995) [15] with little modification.

Statistical analyses

All the experiments were performed in triplicate and the data presented as mean ± SEM. Statistical package SPSS version 20 was used. Analyses were carried out using one–way analysis of variance (ANOVA) and the differences among means were further analyzed by least significance difference (LSD) at 95% level (p ≤ 0.05).

Results

Proximate composition

Carbohydrate content per 100 gm of strain 5, 7 and mix had been found to be 37.18 gm, 51.65 gm and 44.91 gm, respectively (Table 1). Protein content per 100 gm of strain 5, 7 and mix had been found to be 278.85mg, 298.69mg and 286.19mg, respectively (Table 1). Lipid content per 100 gm of strain 5, 7 and mix had been found to be 2.43mg, 1.96 mg and 2.4 mg, respectively (Table 1). Protein content per 100 gm of strain 5, 7 and mix had been found to be 37.18 gm, 51.65 gm and 44.91 gm, respectively (Table 1). Moisture content per 100 gm of strain 5, 7 and mix had been found to be 10.27 mg, 12.61 mg and 12.19 mg, respectively (Table 1). Ash content per 100 gm of strain 5, 7 and mix had been found to be 12.48mg, 12.23 mg and 14.67 mg, respectively (Table 1). Protein content per 100 gm of strain 5, 7 and mix had been found to be 37.18 gm, 51.65 gm and 44.91 gm, respectively (Table 1). Lipid content per 100 gm of strain 5, 7 and mix had been found to be 2.43mg, 1.96 mg and 2.4 mg, respectively (Table 1). Protein content per 100 gm of strain 5, 7 and mix had been found to be 37.18 gm, 51.65 gm and 44.91 gm, respectively (Table 1). Moisture content per 100 gm of strain 5, 7 and mix had been found to be 10.27 mg, 12.61 mg and 12.19 mg, respectively (Table 1). Ash content per 100 gm of strain 5, 7 and mix had been found to be 12.48mg, 12.23 mg and 14.67 mg, respectively (Table 1). Protein content per 100 gm of strain 5, 7 and mix had been found to be 37.18 gm, 51.65 gm and 44.91 gm, respectively (Table 1). Lipid content per 100 gm of strain 5, 7 and mix had been found to be 2.43mg, 1.96 mg and 2.4 mg, respectively (Table 1). Protein content per 100 gm of strain 5, 7 and mix had been found to be 37.18 gm, 51.65 gm and 44.91 gm, respectively (Table 1). Moisture content per 100 gm of strain 5, 7 and mix had been found to be 10.27 mg, 12.61 mg and 12.19 mg, respectively (Table 1). Ash content per 100 gm of strain 5, 7 and mix had been found to be 12.48mg, 12.23 mg and 14.67 mg, respectively (Table 1).

Phytochemical and antioxidant content

As shown in Table 2, content of ascorbic acid, total polyphenol, total flavonoid, reducing sugar was higher in G. lucidum 7 than those of G. lucidum 5 and mix. Similar trend was observed for FRAP and DPPH free radical scavenging potentiality. Thus, among the three strains studied in this experiment, G. lucidum 7 contained the highest phytochemical and antioxidant capacity.

Discussion

Strains of G. lucidum studied in the present experiment (strain 5, 7 and their mix), vary from each other with respect...
Flavonoids are class of secondary plant metabolites with significant antioxidant and chelating properties. They have anti-inflammatory, anti-microbial and anti-cancer activity [4]. Thus, the reducing ability of *G. lucidum* 7 was found to be the highest among the three samples.

### Conclusion

Three strains of *G. lucidum* 5, 7 and their mix were analyzed for proximate and phytochemical composition as well as for antioxidant potentiality. The mix was used to evaluate whether it contains higher nutritive and medicinal components than strain 5 and 7 alone. Among them, strain 7 had been found the best in terms of nutritional and antioxidant capacities. Thus, this strain of *G. lucidum* could be cultivated in large scale and studied for further therapeutic usage.

### References