



## AMERICAN JOURNAL OF PHARMTECH RESEARCH

Journal home page: <http://www.ajptr.com/>

### Comparative nutritional potential of three dominant edible and medicinal macrofungi of Kathmandu valley, Nepal

Sanjay Kumar Jha<sup>1\*</sup>, N.N. Tripathi<sup>1</sup>

1. Bacteriology and Natural Pesticide Laboratory, Department of Botany, DDU Gorakhpur University, Gorakhpur – 273009.

#### ABSTRACT

During present laboratory experiment, comparative analysis of three dominant edible and medicinal macro fungal species viz., *Laccaria lacata*, *Lycoperdon pyriforme* and *Ramaria botrytis* with reference to protein, carbohydrate and fat was done. The biochemical analysis revealed that the studied macro fungi contained 25.71, 38.0, 13.55% protein, 58.5, 49.88, 72.88% carbohydrate and 3.3, 9.6, 4.22% fat respectively. Besides this, the studied mycotaxon have promising moisture, dry matter, ash and crude fibers contents. In addition, pH of individual fungal species was determined in order to verify their edibility test. Thus, this study proves that aforesaid macro fungi can be used in well balanced diets due to their nutritional value.

**Keyword:** Wild macro fungi, Nutritive value, Kathmandu valley

\* Corresponding Author Email: <mailto:sanjayjha@rediffmail.com>

Received 7 April 2012, Accepted 13 April 2012

## INTRODUCTION

Nepal offers a wide spectrum of habitats and ecosystem due to diverse bio-geographic setting, horizontal and vertical dissimilarities, climatic contrasts and altitudinal variations. Fungal protein, carbohydrate and fat have been suggested as a possible potential source which can meet the demands of the growing population. Traditional Nepalese food mushroom has relatively low priority due to number of misbeliefs and low level of understanding. However, interestingly these days there is growing trend on consumption of mushroom because of its healthy benefits of very low cholesterol, low calorie and its fine taste. The wild edible macro fungi of the Kathmandu valley has only limited work in Biochemical estimation. The increased interest in the consumption of mushrooms as food stems from their nutritional and therapeutic values. The protein content of mushrooms has been reported to be twice that of vegetables and four times that of oranges,<sup>1</sup> and significantly higher than that of wheat,<sup>2</sup>. It is not surprising therefore that Okwulehie and Odunze<sup>3</sup>, reported that the increased demand for mushrooms could be contingent upon the phenomenal rise in the unit costs of the conventional sources of animal proteins such as beef, pork, chicken and fish as opined by Aletor<sup>4</sup>. Mushrooms contain appreciable quantities of crude fibers. Although little information exists on the Total Dietary Fibre (TDF) content of mushroom, the crude fibre contents values reported by many authors, suggest that mushrooms are potential sources of dietary fibers;<sup>5, 6</sup>. According to Oso<sup>7</sup> and Okwulehie and Odunze<sup>8</sup>, mushrooms generally contain low fat and oil content. Because of the low content of lipid, they are recommended as good food supplement for patients with cardiac problems. Therefore, this study focuses on the nutritional quality of wild edible macrofungi collected from natural vegetation of Kathmandu valley, Nepal.

## MATERIALS AND METHODS

The sporocarps of test fungi were produced from their natural habitat at various locations of Kathmandu valley. The type vegetation at the sites of collection consisted of subtropical to temperate forests. They were harvested fresh and fleshy in rainy seasons of 2010 – 2012. Identification of various macrofungal genera was made using publication of Adhikari<sup>9</sup>, Arora<sup>10</sup>, Singer<sup>11</sup> and also identification was made on the basis of critical observations of specimens and Mycokey. The collected samples were deposited in Bacteriology and Natural Pesticide Laboratory, Department of Botany, DDU Gorakhpur University, Gorakhpur U.P. India. Collected samples were *Laccaria laccata*, *Lycoperdon pyriforme* and *Ramaria botrytis*. The location of their collection and their habitates are summarized on **Table 1**. For analysis, fruit

bodies were dried in oven at 80°C for 48h and powdered in a grinder. The fine powdered samples were stored into air-tight bottles and kept in a cool dry place until required for the analysis. All the analysis were done in triplicates. The collected samples were analyzed for their biochemical estimation by following parameters viz., protein, carbohydrate, lipid, moisture, dry matter, ash, crude fibre, and determination of pH.

**Table 1 local name and habitat of macrofungal species.**

Scientific name	Local name	Habitat
<i>Laccaria laccata</i> (Scop.:Fr.)Cooke	Jhari chyau	on soil
<i>Lycoperdon pyriforme</i> Schaeff.Pers	Phusphuse chyau	on rotten wood
<i>Ramaria botrytis</i> (Pers.: Fr.) Ricken	Kauli chyau	hardwood logs

### Estimation of protein

The protein content of each specimen was carried out by the method described by Lowry<sup>12</sup> using bovine serum albumin as standard. The optical density of each specimen was measured at 650 nm using the colorimetrically.

Standard curve of casein protein was (range 0-100µm/ml) plotted and amount of protein content present in samples was determined using standard curve.

### Estimation of carbohydrate

Carbohydrate estimation was done following Anthrone method of Thimmaiah<sup>13</sup>. The anthrone reaction is the basis of rapid and convenient method for the determination of hexoses, aldopentose and hexuronic acids either free or present in polysaccharides, carbohydrates are dehydrated by Conc. H<sub>2</sub>SO<sub>4</sub> to form furfural. Furfural condenses with anthrone (10-Keto-9, 10-dihydro anthracene) to form a blue-green coloured complex, which is measured calorimetrically at 630 nm.

### Estimation of lipid

The estimation of lipid was performed according to the method of Bligh and Dyer<sup>14</sup> with some modification. The tissue is extracted in chloroform:methanol mixture (10:20v/v) filtered and re-extracted with chloroform. The chloroform layer is evaporated to dryness, weighed and the percent total lipid is calculated.

### Moisture content

The fresh weight of each mushroom samples was taken using chemical balance. These samples were then oven dried separately at 80°C for 48 h. Weight loss obtained after drying was regarded as the moisture content of each specimen AOAC (Association of Official Analytical Chemists)<sup>15</sup>.

### Dry matter content

Dry matter content of the studies mushroom samples was determined by drying the samples in Oven at 80°C for 48 h.

### Ash content

The powdered mushroom samples were taken in the crucible and allowed to burn for 1h. The matter was transfer to desiccators and allowed to cool at room temperature and weighed <sup>16</sup>.

### Crude fiber

Crude fibers of the mushroom samples were determined according to the standard method Association of Official Agricultural Chemists<sup>17</sup>.

### Determination of pH

The determination of pH of different mushroom samples was done. For this, the known amount of each mushroom was crushed in to distilled water (pH 7.0) with the help of pestle and mortar and homogeneous mixture was filtered with the help of Whatman filter paper no.1 using funnel. The filtered material was collected into boiling tube and the pH of filtrate was taken with the help of pH meter.

## RESULTS AND DISCUSSION

This result is not a surprise because the vegetation of this area is a tropical to temperate rain forest, which supports the luxuriant growth of wild macrofungi. Although specific mushroom species were collected from four sites of Kathmandu valley (Phulchowki, Chndragiri, Sivpuri and Nagarjun). The results only gave indication of the areas where the sporocarps could be collected in very large quantities.

**Table 2 Biochemical Parameters in Percent**

Biochemical parameters	Values in percentage		
	<i>L. laccata</i>	<i>L. pyriforme</i>	<i>R. botrytis</i>
Protein	25.71	38.00	13.55
Carbohydrate	58.50	49.88	72.88
Lipid	3.30	9.60	4.22
Moisture	87.88	81.00	87.30
Dry matter	12.22	19.00	12.70
Ash	11.75	5.25	7.25
Crude fibre	11.00	8.00	5.00

During present analysis, it is found that the moisture content of the collected mushrooms samples ranges from 81.00% to 87.88% (**Table 2**) The matured sporocarps of *Laccaria laccata* contain highest amount of moisture content 87.88 % with the lowest amount of dry matter (12.12). This was followed in order by young sporocarps of *Lycoperdon pyriforme* 81.00%, dry matter (19.00%) and *Ramaria botrytis* had 86.25% moisture, dry matter 13.75%. This highest moisture

content is an indication that fresh macrofungi cannot be kept for long time. This is because of high water activity enhances microbial growth<sup>18</sup>. Similar observation was made by Fasidi<sup>19</sup> and Leon-guzman<sup>20</sup> for *V. esculenta* for mushrooms of Queretaro Mexico and Sanmee<sup>21</sup> for Thailand mushrooms.

*Lycoperdon pyriforme* had the highest concentration of protein (38.00%), and *Laccaria laccata* (25.71%) as well as *Ramaria botrytis* had the least protein (13.55%). Hence, the fruitbodies of wild edible Nepales mushrooms can be eaten as a protein supplement or as an alternative to fish and meat in rural areas where these items could not be affordable. Vegetarians could also eat mushrooms because it served as alternative protein supplements in their diet. Mushroom proteins are generally higher than those of green vegetables and oranges<sup>22,23</sup>.

Table 2 also shows that lipid levels of collected sample were 3.30%, 4.22% and 9.60% which were highly important for human health. Further, table 2 indicates that carbohydrate and lipid level of these wild macrofungi were low contents, this suggest that diabetics and those with heart or weight problems can consumes wild edible Nepales macorfungi. The as content of *L. laccata* (11.75%) was higher followed by *R. botrytis* (7.25) and *L. pyriforme* (5.25%). Additionally, the crud fiber content of *L. laccata* (11%) was also found to be higher than other two studied species. The findings suggest that the present Macrofungi contain appreciable amount of crud fiber, which can recover the constipation problems in human beings<sup>5,6</sup>. The low pH (6.1 – 7.2) **Table 3** in the samples further suggests why they may be edible; they are neither acidic nor basic and so they are not likely to certain toxins which could be harmful to men or animals<sup>24</sup>.

**Table 3 pH Value**

Species	pH
<i>L. laccata</i>	7.0
<i>L.pyriforme</i>	6.5
<i>R. botrytis</i>	7.0

## CONCLUSION

The wild edible macrofungi of the Mountainous region of the Kathmandu valley has only limited work in biochemical estimation. During the biochemical bioassay out of three studied species, *Lycoperdon pyrifirme* exhibited highest protein content while *Ramaria botrytis* exhibited highest carbohydrates. Hence, these kinds of information should help to conserve the plant resource and also help local people to know more about the nutritional and medicinal value and uplifted people's livelihood.

## ACKNOWLEDGEMENT

Authors are thankful to Head, Department of Botany, DDU Gorakhpur University, and Gorakhpur for lab. Facilities and Prof. Kamal, for his valuable suggestions. One of the authors (S. K. Jha) thanks Tribhuvan University, Institute of Science & Technology for granting study leave.

## REFERENCES

1. Bano Z, Food value of mushrooms. *Gram Prandyogiki*, 1993; 3: 224-225.
2. Aletor VA. Anti-nutritional factors in some Nigerian feedstuffs, herbage byproducts, crop residue and browse plants. A Monograph Prepared for the Presidential Task Force on Alternative Formulation of Livestock Feed Products Development, Quality, Evaluation and Health Implications. Cabinet Office, Lagos, Nigeria 1990.
3. Okwulehie IC, Odunze, EI. Evaluation of the nutritional value of some tropical edible mushrooms. *J Sustainable Agric Environ* 2004; 6:157-162
4. Aletor VA. Compositional studies on edible tropical specials of mushroom. *Food Chem* 1995; 54: 256-268.
5. Crisan EV, Sands A. Nutritional Value of Edible Mushrooms. In: *The Biology and Cultivation of Edible Mushrooms*, Chang, S.T. and W.A. Hayes (Eds.). Academic press, New York, 1978: 137-167.
6. Kurasawa SL, Sugahana J, Hayashi J. Studies on dietary fibre of mushroom and edible wild plants. *Nutr Rep Int* 1982; 26:167-173.
7. Oso BA. *Pleurotus tuber-regium* from Nigeria. *Mycologia* 1977; 69:271-279.
8. Okwulehie IC, Odunze EI. Evaluation of the myco-chemical and mineral composition of some tropical edible mushrooms. *J. Sustainable Agric Environ* 2004; 6:163-170.
9. Adhikari MK. *Mushroom of Nepal*, Edited by G. Durieu, PU. Printers, Battisputali, Kathmandu, Nepal 2000:236.
10. Arora D. *Mushroom demystified: A comprehensive guid to the fleshy fungi*. Barkely Ten speed press. 1996.
11. Singer R. *The Agaricales in modern Txonomy*. Bishan Singh Mahendrapal Singh, Dehradun (India). 1996:981.
12. Lowry OH, Rosebrough NJ, Far AL, Randal RJ. *J Biol Chem*. 1951:193,265.
13. Thimmaiah SK. *Standard methods of Biochemical Analysis*. Anthrone method, Kalyani Publishers Ludhiana, India. 1999: 54-55.

14. Bligh EG, Dyer WJ. A rapid method of total lipid extraction and purification Can J Physiol 1959; 37:911.
15. AOAC. Official Methods Analysis. 13th Edn, Association of Official Analytical Chemists. Washington DC. USA, 1980.
16. Manzi P, Gambelli L, Marconi S, Vivanti V, Pizzoferrato L. Nutrients in edible mushrooms: An interspecies comparative study. Food Chem 1999; 65: 477-482.
17. AOAC. Official methods of Analysis of Association of Official Analytical Chemist (15th Edn.). Washington DC 1990.
18. Brock OT, Thomas K, Brock M, David MW. Basic Microbiology with Applications. Antibiotics and other chemotherapeutic agents 3rd Edn. 1986:144-155.
19. Fasidi IO. Studies on *Volvariella esculenta* (Mass) Singer: Cultivation on agricultural wastes and proximate composition of stored mushrooms. Food Chem 1996; 55: 161-163.
20. Leon-Guzman MF, Silva I, Lopez MG. Proximate chemical composition, free amino acid contents of some wild edible mushrooms from Queretaro Mexico. J Agric Food Chem. 1997; 45: 4329-4332.
21. Sanmee R, Dell B, Lumyong P, Izumori K, Lumyong, S. Nutritive value of popular wild edible mushroom from Northern Thailand Food Chem 2003; 82: 527-532
22. Jonathan SG. Vegetable growth requirements and antimicrobial activities of some higher fungi in Nigeria Ph.D. thesis, University of Ibadan 2002..
23. Chan HKM. Consumption of edible mushrooms in Hong Kong. Mushrooms News letter Tropics 1981; 1: 5-10.
24. Adedayo MR, Olasehinde IG, Ajayi AA. Nutritional Value of some edible Mushrooms from Egbe farmland, west Yagaba Local Government Area, Kogi State, Nigeria African J Food Sci 2010; 4(5):297-299