BALNEO RESEARCH JOURNAL English Edition
eISSN 2069-7619 pISSN 2069-7597 ROMANIAN ASSOCIATION OF BALNEOLOGY

Pleurotus tuber- regium (Rumph. ex Fr.) Singer a potent source of antioxidant

Sukumar Dandapat[1], Manoj Kumar[1,2], Rakesh Ranjan[1] and Manoranjan Prasad Sinha[1,3]

Corresponding author: **Sukumar Dandapat**, E-mail: dr.sukumar2018@gmail.com

Balneo Research Journal DOI: http://dx.doi.org/10.12680/balneo.2018.186 Vol.9, No.3, September 2018 p: 228 –231

***Department of Zoology, Ranchi University, Ranchi-834008, Jharkhand, India.**

Abstract

Mushrooms have been used as traditional source of nutritional food and medicinal suppliments. *P. tuber-regium* has been well known edible fungi and posses bioactive mycochemicals such as flavonoids, phenols, alkaloids, glycosides, proteis, fattyacids etc. and possess good antioxidant activity. Among estimated biochemicals alkaloid was found in high quantity (28.14 ± 0.32mg/100g) and tannin in low quantity (2.74 ± 0.26mg/100g). The mushrooms extract also posses good antioxidant potentiality. Estimated freeradical scavenging cativity was 8.98±1.02%, hydroxy radical scavenging activity was 10.85±0.73% and total antioxidant capacity of the crude extract was 21.50±1.3% at 100µg/100mL concentration of extract.

Key words: *Mushroom, mycochemical, medicinal, antioxidant*

Introduction.

In recent decades population explosion and its burden is directly associated with burden of communicable and noncommunicable diseases such as diabetes, renal, cardiovascular, respiratory, cancer and diseases associated with microbial infections[1,2]. Generation of oxidative agents or freeradicals (Reactive oxygen and nitrogen species) are very high during pathogenic infections, injuries[3].

It has been found the generation of the oxidative species rapidly increasing due to recent pattern of lifestyle[4]. Free radical at high concentrations damage cellular and subcellular[5] and trig generation of chronic disease and disorders such as Alzheimer's disease, Parkinson's disease, multiple sclerosis, ischemic heart disease, chronic renal failure, cancer etc.[6,7].

Traditionally mushrooms have been used as medicine as well as very good source of nutrient [8]. About 700 species of mushrooms have been reported for their significant therapeutic efficacy [9]. Medicinal mushrooms contain various mycochemicals such as tannins, alkaloids, flavonoids, phenolics etc., which associated with remedy of diseases and disorders. *Pleurotus tuber-regium* (Rumph. ex Fr.) Singer, commonly called king oyster mushroom, has been traditionally consumed as medicine and nutraceutical food supplement [10].

The aim of the present study was to evaluate proximate biochemical composition antioxidant activity of *P. tuber-regium*.

Material and Methods

Collection, identification and preparation of extract

Fresh fruiting bodies of *P. tuber-regium* were collected from different sites of Assam and were identified and brought to Department of Zoology, Ranchi University, Ranchi form preparation of extract. Fresh mushrooms were dried in shade, powdered and sieved. 50g of the fine powder was subjected to extraction chamber of soxhlet using distilled water. *Mycochemical analysis*

Qualitative analyses of proximate biochemical present in the extract of *P. tuber-regium* were determined following Sofowara [11]. Quantitative estimation of traceable biochemicals was done following Dnadapat *et al* [12].

.

Antioxidant activity

Antioxidant activity of *P. tuber-regium* extract was determined on the basis of total antioxidant activity [13,14], freeradical scavenging [15] and hydroxyl radical scavenging activity [16] using standard methods.

Results and Discussion

Mycochemical analysis

The result of qualitative biochemical analyses of *P. tuber-regium* presented in table-1. The result biochemicals such as carbohydrates, glycosides, proteins, tannins, saponins, alkaloids, steroids, and lipids are present in extract of *P. tuber-regium*.

Previously preliminary biochemical analysis of edible white button mushroom *Agaricus bisporus* was done and presence of biochemical such as saponins, tannins, glycosides, reducing sugar, alkaloid, flavonoid, terpenoid etc. were reported [17].

Table 1: Qualitative biochemical analysis of *P. tuber-regium* extract

Mycochemicals	Present(+) or Absent (-)	Inference	Name of Test
Carbohydrate	+	Blue coloured solution was observed	Molish's Test
Glycosides	+	Green coloured complex was formed	Anthrone test
Protein	+	Blue coloured was observed	Bradford's test
Alkaloid	+	Orange colour was observed	Dragendroff test
Steroid	+	Steroid and H_2SO_4 layers separated and sample layer forms cherry red colour and acid layer forms green colour	Salkwoski test
Triterpene	+	Red colour was formed	Chloroform and Conc.H_2SO_4 test
Flavonoid	+	Yellow colour formation was observed	NaOH test
Tannin		Yellow precipitate was observed	$FeCl_3$ test
Lipid	+	Original colour of iodine disappeared	Iodine test
Saponin	+	Clear soap formation was observed	KOH test

Result of qualitative biochemical analysis of traceable mycochemical is presented in figure- 5. Among the mycochemicals alkaloid was found in high quantity (28.14 ± 0.32mg/100g) and tannin in low quantity (2.74 ± 0.26mg/100g). It has been reported other mushroom also contain 64.12 ± 1.2 mg/g phenols, 0.016 ± 0.001 mg/g flavanoid, 0.28 ± 0.04mg/g saponins, 0.1 ± 0.04% alkaloids and 0.014 ± 0.003 % tannins in *Tricholoma nudum* and 6.012 ± 0.91 mg/g phenols, 0.031 ± 0.02 mg/g flavanoids, 0.27 ± 0.008mg/g saponins, 2.0 ± 0.01% alkaloids and 0.014 ± 0.001 % tannins in *Psalliota campestris* and the biochemicals possess therapeutic efficacy [18]. Biochemicals such as phytophenols, flavonoids, tannins, saponins etc. are associated with reduction of reeeradicals and decrease the risks of disease and disorders associated with oxidative stress [19-21].

Antioxidant activity

Antioxidant activity of *P. tuber-regium* was determined on the basis of free radical scavenging, hydroxyl radical scavenging capacity and total antioxidant activity of the mushroom extract. Results of antioxidant activity of *P. tuber-regium* are presented in figure-6, 7 and 8. BHA (Butylated Hydroxy Anisole) is a synthetic reducinh agent and its Freeradical scavenging cativity is quite higher than the extract. However, the extract also shows good freeradical scavenging activity. 100 µg/mL of extract showed highest freeradical scavenging activity (8.98±1.02%) among the tested concentrations of extract. Hydroxy radical scavenging activity of extract was compared with ascorbic acid and found 100µg/mL of extract showed highest (10.85±0.73%) hydroxyradical scavenging activity among the tested extract but the ascorbic acid showed more effective scavenging activity (68.11±2.46%). Total antioxidant capacity of the crude extract of showed very effective result. 100µg/mL extract showed 21.50±1.3% antioxidant activity equivalent to ascorbic acid when compared to same concentration of BHA (65 ± 1.5% antioxidant activity). However 10 µg/mL extract did not show any activity. Antioxidant activity of *Pleurotus florida* and *Calocybe indica* studies and reported hydroxyl radical scavenging of extracts of *P. florida* and *C. indica* 65.41±0.65 % at 1000 µg/ml and 46.99±2.58 % at 1000 µg/ml respectively [22].

It has been reported antioxidant activity of plant and mushroom extracts are concentration dependent and the antioxidant activity depends upon the concentration of bioactive mycochemicals such as alkaloids, tannins, saponins, flavonoids, phenols etc. present in the fruiting body of mushrooms [23]. It has also been reported bioactive chemicals including primary and secondary metabolites of plant and mushroom origine posses reducing power and reduces the reactive oxygen and nitrogen species produce in the humanbody during pathogenic infections, so that they can act as source of good and safe antioxidants [24,25].

On the basis of above results it is concluded that *P. tuber-regium* can be used as fodder and used as potent source of antioxidant.

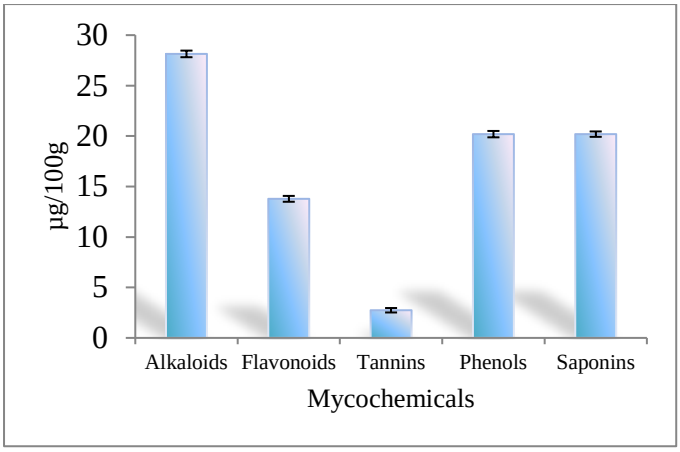

Figure 5: Qualitative analysis of traceable biochemical of *P.tuber-regium*

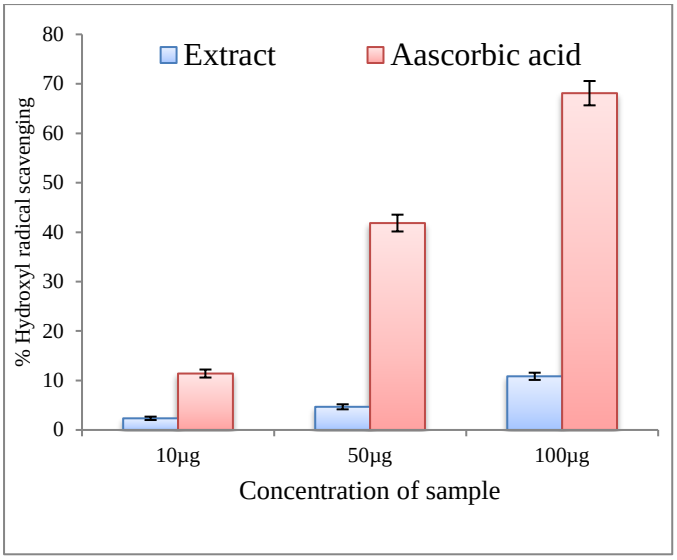

Figure 7: Hydroxyl radical scavenging activity of *P. tuber-regium*

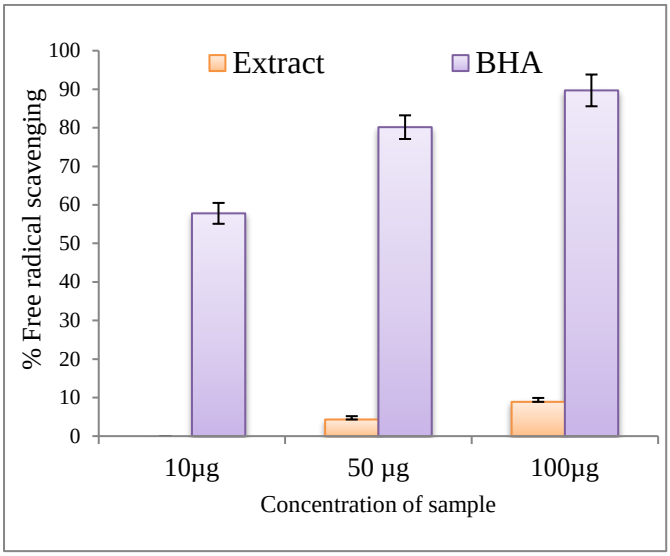

Figure 6: Free radical scavenging activity of *P. tuber-regium*

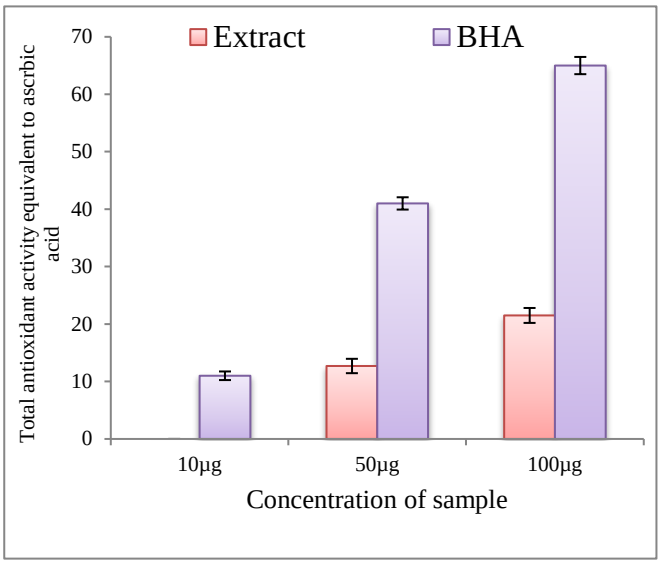

Figure 8: Total antioxidant capacity of *P. tuber-regium* extract

Acknowledgements

The authors acknowledge the financial assistance received from DBT, NER-BPMC, New Delhi (BT/462/NE/TBP/2013) under the Twinning Project to Department of Zoology, Ranchi University, Jharkhand and Department of Botany, Gauhati University, Assam.

Bibliography

1. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. Int J Cancer. 2010; 127: 2893–2917.
2. WHO (World Health Organization). Global Health Estimates: Deaths by Cause, Age, Sex and Country, 2000-2012. Geneva. 2014.
3. Alwan A, Maclean DR, Riley LM, d'Espaignet ET, Mathers CD, Stevens GA, Bettcher D. Monitoring and surveillance of chronic noncommunicable diseases: progress and capacity in high-burden countries. The Lancet. 2010; 376:1861–1868.
4. Niki, E. Assessment of antioxidant capacity *in vitro* and *in vivo*. Free Radical Biol. and Med. 2010; 49: 503-515.
5. Kihira T, Okamoto K, Sakurai I, Arakawa Y, Wakayama I, Takamiya K, Okumura R, Iinuma Y, Iwai K, Kokubo Y, Yoshida S. Lifestyle Changes and Oxidative Stress in a High-incidence Area of Amyotrophic Lateral Sclerosis in the Southwestern Kii Peninsula, Japan. Intern Med. 2017; 56(12):1497-1506.
6. Coker, Christopher, Poore CA, Li X, Mobley HLT. Pathogenesis of Proteus mirabilis urinary tract infection. Microbes and Infection. 2000; 2: 1497-1505.
7. Valko M, Leibfritz D, Moncol J, Cronin MTD, Mazur M,Telser J. Free radicals and antioxidants in normal physiological functions and human disease. The Int. J. Biochem Cell Biol. 2007; 39: 44-84.
8. Ullah A, Khan A, Khan I. Diabetes mellitus and oxidative stress—A concise review. Saudi Pharmaceutical Journal. 2016; 24: 547–553.
9. King TA. Mushrooms, the ultimate health food but little research in U.S to prove it. Mushroom News. 1993; 41: 29–46.
10. Karaman M, Vesic M, Stahl M, Novakovic M, Janjic L, Matavuly M. Bioactive properties of wild-growing mushroom species *Ganorderma applanatum* (Pers.) Pat. from Fruska Gora Forest (Serbia). Ethnomed Ther Valid. 2012; 32: 361–377.
11. Patel Y, Naraian R, Singh VK. Medicinal properties of *Pleurotus* species (Oyster mushroom): a review. World J Fungal Plant Biol. 2012; 3: 1–12.
12. Sofowara A. *Medicinal Plants and Traditional Medicinal in Africa*. 3rd ed. Spectrum Books, Ibadan, Nigeria. 2008.
13. Dandapat S, Kumar M, Sinha MP. Synthesis and characterization of green silver nanoparticles mediated by Aegle marmelos (L.) leaf extract. ICIRD NPT, ISBN: 978-935-107-293-5. Elsevier India Pvt. Ltd. 2015. Nanobio Pharmaceutical Technology: 38-44.
14. Prieto P, Pineda M, Aguilar M. Spectrophotometric quantitation of antioxidant capacity through the formation of phosphomolybdate complex: specific application to the determination of vitamin E. Anal Biochem. 1999; 269: 337–341.
15. Dandapat S, Kumar M, Sinha MP. Therapeutic efficacy of *Cinnamomum tamala* (Buch.-Ham.) and *Aegle marmelos* (L.) leaf. Balneo Res J. 2014; (5)3: 113-122.
16. Dandapat S, Kumar M, Kumar A, Sinha MP. Antipathogenic efficacy of methanolic leaf extract of *Cinnamomum tamala* and *Aegle marmelos* (L.) with their nutritional potentiality. The Bioscan. 2013; 8(2):-Supplement on Medicinal Plants. 635-641.
17. Kumar S, Kumar D, Saroha KM., Singh N, Vashishta B. Antioxidant and free radical scavenging potential of *Citrullus colocynthis* (L.) Schrad. methanolic fruit extract, Acta Pharma. 2008; 58; 215–220.
18. Klein SM, Cohen G, Cederbaum AI. Production of formaldehyde during metabolism of dimethyl sulphoxide by hydroxyl radical generating system. Biochemi. 1991; 20, 6006-6012.
19. Singh S, Lal AA, Simon S, Ramteke PW. Efficacy of selected botanicals on biochemical constituents of white button mushroom *Agaricus bisporus* (Lange) Imbach. J Pharmacogn Phytochem. 2017; 6(5): 2070-2076.
20. Udu-Ibiam OE, Ogbu O, Ibiam UA, Nnachi, AU, Agah MV, Ukaegbu CO, Chukwu OS, Agumah NB, Ogbu KI. Phytochemical and antioxidant analyses of selected edible mushrooms, ginger and garlic from Ebonyi state, Nigeria. Pharmacy of Biological Sciences 2014; 9(3): 86-91.
21. Ozen T, Collu Z, Korkmaz H. Antioxidant properties of *Urtica pilulifera* root, seed, flower, and leaf extract. J Medicinal Food. 2010; 13: 1224-1231.
22. Sudha G, Vadivukkarasi S, Shree RBI, Lakshmanan P.Antioxidant activity of various extracts from an edible mushroom *Pleurotus eous*. Food Sci Biotechnol. 2012; 21(3): 661-668.
23. Dandapat S, Kumar M, Sinha MP. Pharmacological and phytochemical screening of *Aegle marmelos* (L.) and *Cinnamomum tamala* (Buch.-Ham.) leaves for therapeutic efficacy. Middle-East Journal of Scientific Research. 2014; 22 (5): 626-632, 2014
24. Dandapat S, Sinha MP, Kumar M, Jaggi Y. Hepatoprotective efficacy of medicinal mushroom *Pleurotus tuber-regium*. Environ Experim Biol. 2015; 13: 103–108