ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Phytochemical Analysis of Two Wild Edible Mushrooms, *Auricularia Polytricha And Pleurotus Ostreatus,* Common in Ohaukwu Area of Ebonyi State, Nigeria

Afiukwa CA[1], Ugwu[2], Okechukwu PC, Ebenyi LN[1], Oketa HA[1], Idenyi JN[1], and Ossai Emmanuel C[2]

[1]Department of Biotechnology, Faculty of Biological Sciences, Ebonyi State University, P.M.B. 053, Abakaliki, Nigeria.
[2]Department of Biochemistry, Faculty of Biological Sciences, University of Nigeria Nsukka, Enugu State, Nigeria.

ABSTRACT

The concentrations of phytochemicals in two edible mushroom varieties (*Auricularia polytricha* and *Pleurotus ostreatus*) from Ohaukwu area of Ebonyi State, Nigeria, were determined using standard methods. The result revealed the presence of alkaloids, flavonoids, saponins, oxalates, phytates, HCN and phenols in appreciable amounts. Significant variations in composition of the phytochemicals were observed between the mushrooms ($P < 0.05$). The obtained values of the phytochemicals were significantly lower in both mushroom varieties compared to their toxic levels according to World Health Organization's stipulated safe limits. Thus, the study suggests that both mushrooms varieties are very safe for consumption, while the significant presence of alkaloids, flavonoids, saponins and phenols indicate medicinal properties.

Keywords: Mushrooms, phytochemicals, food safety, *Auricularia polytricha* and *Pleurotus ostreatus*.

***Corresponding author*:**
Email: afiukwa@yahoo.com and oky9992000@yahoo.com

ISSN: 0975-8585

INTRODUCTION

Edible mushrooms are the fleshy and edible fruit bodies of several species of fungi. Mushrooms belong to the macro fungi, because their fruiting structures are large enough to be seen with the naked eye. They can appear either below ground (hypogeous) or above ground (epigeous) where they may be picked by hand. Edibility may be defined by criteria that include absence of poisonous effects on humans and desirable taste and aroma [25].

Edible mushrooms are consumed by humans for their nutritional and medicinal values. Mushrooms consumed for health reasons are known as medicinal mushrooms. While hallucinogenic mushrooms (e.g. Psilocybin mushrooms) are occasionally consumed for recreational or religious purposes, they can produce severe nausea and disorientation, and are therefore not commonly considered edible mushrooms [6].

Edible mushrooms include many fungal species that are either harvested wild or cultivated. Easily cultivatable and common wild mushrooms are often available in markets, and those that are more difficult to obtain (such as the prized truffle and matsutake) may be collected on a smaller scale by private gatherers. Some preparations may render certain poisonous mushrooms fit for consumption [21].

Before assuming that any wild mushroom is edible, it should be identified and tested. Proper identification of the specie is the only safe way to ensure edibility. Some mushrooms that are edible for most people can cause allergic reactions in some individuals, and old or improperly stored specimens can cause food poisoning. Deadly poisonous mushrooms that are frequently confused with edible mushrooms are responsible for many fatal poisonings. This includes several species of the *Amanita* genus, in particular, *Amanita phalloides*, the *death cap* [31].

The act of consuming mushrooms dates to ancient times. Edible mushroom species have been found in association with 13,000 year old ruins in Chile, but the first reliable evidence of mushroom consumption dates to several hundred years BC in China. The Chinese value mushrooms for their medicinal properties as well as for food. Ancient Romans and Greeks, particularly the upper classes, used mushrooms for culinary purposes. Food tasters were employed by Roman Emperors to ensure that mushrooms were safe for consumption [6].

Mushrooms are also easily preserved, and historically have provided additional nutrition over winter. Many cultures around the world have either used or continue to use psilocybin mushrooms for spiritual purposes as well as medicinal mushrooms in folk medicine. Some fungi consumed by humans are currently cultivated and sold commercially. Commercial cultivation is important ecologically, as there have been concerns of depletion of larger fungi such as chanterelles in Europe, possibly because the group has grown so popular, yet remains a challenge for cultivation [21].

ISSN: 0975-8585

Mushroom cultivation has a long history, with over twenty species commercially cultivated. Mushrooms are cultivated in at least 60 countries with China, the United States, Netherlands, France and Poland being the top five producers in 2000 [19].

The aim of this research was to analyse the two wild grown edible mushrooms commonly used in Ohaukwu metropolis of Ebonyi State, Nigeria for their phytochemical contents in order to note and compare their various concentrations.

MATERIALS AND METHODS

Determination of Phytochemical Contents

The two edible mushrooms used in this research were obtained from Ohaukwu L.G.A of Ebonyi State, Southeast Nigeria. The samples were washed with distilled water, dried and ground using a high speed milling machine. Tannin content of the sample was determined by Folin Denis colometric method. Saponin and alkaloids were determined by the double solvent gravimetric extraction and alkaline precipitation methods as described by Harborne [15]. Phenol concentration was determined by the Folin –Ciocatean spectrophotometer method by AOAC (1990). Flavonoid was determined by the method described by Harbone (1973). HCN was determined in the samples by alkaline Picrate colorimetric method by Balogopalin et al. (1988). Phytates and oxalates were determined by the method reported by AOAC (1990).

RESULTS AND DISCUSSION

Phytochemical Concentration

Phytochemical screening was carried out on wild grown *Pleurotus ostreatus* and *Auricularia polytricha* in Ohaukwu Local Government Area of Ebonyi State, Nigeria. The results of the analyses are shown in table 1. The results showed the presence of flavonoids, saponins, alkaloids, phenol, HCN, oxalate and phytates.

Table 1: Mean Concentrations of Phytochemicals in Two Mushroom Varieties from Abakaliki, Nigeria (n=3).

Phytochemicals	*Auricularia polytrichia*	*Pleurotus ostreatus*	Grand average
Alkaloid (%)	0.37±0.01[a]	0.15±0.01[b]	0.26±0.12
Saponin (%)	0.02±0.00[b]	0.15±0.01[a]	0.08±0.07
Flavoniod (%)	0.07±0.01[b]	0.33±0.01[a]	0.20±0.15
HCN (mg/100g)	6.86±0.03[a]	4.20±0.09[b]	5.53±1.46
Phenol (%)	0.058±0.01[b]	0.222±0.01[a]	0.14±0.09
Oxalate (%)	0.41±0.01[a]	0.22±0.01[b]	0.32±0.11
Phytate (%)	0.29±0.01[a]	0.15±0.05[b]	0.22±0.08

*Means with the same letter on the same row are not significantly different at 0.05 probability level.

The saponin contents of the mushrooms varied from 0.02-0.15% with a mean value of 0.08 ± 0.07%. The values obtained for saponins in this study are within the WHO maximum

permissible limit of (48.50mg/100g). The results suggest that these mushrooms could be safe for consumption.

The flavonoid compositions of the two edible mushrooms are significantly lower than the tolerable limit (52.02mg/100g) (WHO, 2003), indicating that the mushrooms are equally safe and could be good sources of anti-oxidants that boosts body immunity. The flavoniod contents ranged from 0.07-0.33% with a mean value of 0.20 ± 0.15%.

The results of the HCN contents of these edible mushroom varieties suggest that *Pleurotus ostreatus* is more poisonous than *Auriuclaria polytricha* in comparism of their HCN (Hydrogen cyanide) contents and need to be processed more properly before consumption. The HCN contents were 6.86 and 4.20ppm with a mean value of 5.53 ± 1.46. The results indicate that the HCN contents of these fungi differ significantly ($p < 0.05$). The values compare well with the 5.8ppm reported by Chang (1994).

The alkaloid contents of these edible mushrooms were 0.37 and 0.15% with an average value of 0.26 ± 0.12%. The highest value was detected in *Pleurotus ostreatus.* The results showed that the alkaloid concentrations of the edible mushrooms are lower than the WHO safe Standard limit of (61.00mg/100g) and also that there is a significant variation in the alkaloid compositions of these fungi when compared ($p < 0.05$). The values obtained indicate that the mushrooms are safe for consumption in large quantity and can help in relieving of pains.

Oxalate concentrations of *Pleurotus ostreatus* and *Auricularia polytricha* ranged from 0.22-0.41% with a mean value of 0.32 ± 0.11%. This shows that *Pleurotus ostreatus* recorded higher oxalate content. The results are much lower compared to World Health Organization tolerable limit of (105.00mg/100g) and this corroborated with the 0.412% reported by Harden [12].

The results obtained in this study showed a significant difference in the phytate compositions between the two edible mushroom varieties. The phytate content of *Pleurotus ostreatus* and *Auricularia polytricha* are 0.29 and 0.15% respectively. These results are 100 times lower than the standard safe limit (22.10mg/100g) [37].

Phenol concentrations of these edible mushrooms from Ohaukwu Local Government Area of Ebonyi State ranged from 0.06-0.22% with an average value of 0.14 ± 0.09%. This showed that there was an appreciable variation of phenols in the mushrooms and their concentrations are lower than the World Health Organization Standard safe limit. The results indicated that *Auricularia polytricha* had the highest value of (0.22%) against 0.06% detected in *Pleurotus ostreatus.*

CONCLUSION

The phytochemical compositions observed in this study have shown the presence of some vital phytochemicals. The results showed that these edible mushroom varieties could be

safe for consumption as their various phytochemical concentrations were found to be significantly lower than their world health organizations reported safe limits. The observed levels suggest that these mushrooms would be a good source of some natural antibiotics and antioxidants. Therefore, consumption of these mushrooms in large quantity has no toxic effect and need to be domesticated owning to its nutritional and pharmacological essence.

REFERENCES

[1] Adesegun SA, and Coker HA. Nigeria Journal of Pharmaceuticals 2001; 32: 50-63.
[2] Ali M, Shuja MN, Zahoor M, Qadri, I. African Journal of Biotechnology 2010; 9(11): 1551-1554.
[3] Asef MR. Journal of Mycology 2012; 5 (8): 222-310.
[4] Beltran- Garcia, Miguel J, Estarron-Espinossa, Mirna and Oguro, Tetsuva. Journal of Agricultural and Food Chemistry 1997; 45(10): 4049.
[5] Bingham RC. Journal of American Board of Botanists 1978; 17: 467-469.
[6] Boa E. Food and Agriculture Organization of the United Nations 2004; 92 (5): 105-157.
[7] Chang, shu-Ting and Philip G, miles. Mushroom: cultivation, nutritional value, medicinal effect and environmental impact CRC press 1989; 4-6.
[8] Chang Shu-Ting: miles and Philip G. Pleurotus a mushroom of broad adaptability. Mushroom cultivation, nutritional value, medicinal effect and environmental impact (2nd edition). CRC press. 2004, pp.515-525.
[9] Clarke ECC. The forensic chemistry of alkaloids, 3rd edition marske H.F (editor) volume xii, academic press, New York 1999, pp. 514-590.
[10] Elizabeth Speith. Auricularia polytricha (auriculanaceae). Hear species information 2011, pp.119.
[11] Gunde-Cimerman AI. Experimental mycology 1995; 19(1): 1-6.
[12] Haden M. Chlorophylls, in: chemistry and biochemistry of plant pigment, 6th edition, (Godwin, T.W., editor). Academic press London 2007; 468-490.
[13] Haden M. Chlorophylls. In: chemistry and biochemistry of plant pigment, 4th edition, Godwin TW, (editor). Academic press, London 1997, pp. 462-488.
[14] Hall Lan R. Growing mushrooms; the commercial reality (PDF). Lifestyle farmer (Auckland, New Zealand: rural press) 2010, pp. 42-45.
[15] Harbone JB. Phytochemical method; A guide to London techniques to plant analysis. 4th edition, charpman and Hall, London 2001, pp.270-284.
[16] Hegnaur R. Comparative phytochemistry of alkaloids in comparative phytochemistry. Swain, T., (editor), Academic press, London 2001, pp.211-230.
[17] Henry TA. The plant alkaloid 3rd edition, Church Hill, London, 2002, pp.1-5.
[18] ILSI. Flavonoids and hearth health: proceedings of the ILSI, North America flavonoids workshop, may 31-june, Washington (U.S.A) 2005, pp.55-109.
[19] John Fereira. Mushroom industry USDA mannliberary, cornel, education 2010, pp.3-30.
[20] Jones BA. Cyanogenic glycosides and their function in phytochemical ecology, 2nd edition, Harborne, B (editor). Academic press London, 2007, pp.103-134.
[21] Jordan P. Field guide to edible mushrooms of Britain and Europe. New Holland publishers 2006, pp.10.

[22] Kaufert F. The biology of Pleurotus corticatus fries. Minnesota Agricultural Experiment Station Bulletin 1936, pp.114.
[23] Majak EO and Pass WO. Quality control in food industry in food science and technology series of monographs, 2nd edition. Academic press, London 1989, pp.408-500.
[24] Manske RH. The alkaloid chemistry and physiology, Academic press New York 2006; 3: 56-58.
[25] Mattila P, Suonpan K and Piironen V. Functional properties of edible mushrooms nutrition 2000; 16(7-8): 694-696.
[26] Nakakuki T. Pure and Applied Chemistry 2002; 74(7): 1245-1251.
[27] Okuda T, Toshiba T and Hatano T. Journal of Science and Technology 1991; 5: 127-301.
[28] Okwu DE and Ndu CU. International Journal of Molecular Medicine and Advance Science 2006; 12 (2): 199-203.
[29] Phillips, Roger. Mushrooms publisher Mcmilan 2006, pp. 226.
[30] Rop O, Micek J and Jurikora T. Nutrition Reviews 2009; 67(11): 624-31.
[31] Rubel W, and Arora D. Journal of Economic Botany 2008; 62(3): 223-243.
[32] Saphr DL. Edible and medicinal mushrooms of New England and Eastern Canada. North Atlantic Books, 2009, pp.643-795.
[33] Stamets Paul. "Chapter 22: growth parameters for gurmet and medicinal mushroom species". Growing gourmet and medicinal mushrooms (3rd edition). Berkeley, California, U.S.A: ten speed press, 2000, pp.308-315.
[34] Storey B, Noiles E and Thompson K. Journal of Cryobiology 1998; 37(1): 46-58.
[35] Trease GE and Evans WC. Pharmacognosy len and fobiger 1983; 45-50.
[36] Trudell S and Ammirati J. Mushrooms of the Pacific Northwest. Timber press field guides Portland, Oregon. Timber press 2009, pp.134.
[37] World Health Organization. Post harvest and pressing technology of staple food. Technical compendium, WHO, Agricultural Science Bulletin 2003; 88: 171-172.