Quality Assessment of Edible Ear Mushroom (*Auricularia auricula-judae)* found in Port Harcourt, Rivers State

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ABSTRACT

Quality assessment of Auricularia auricula-judae was carried out in the Department of Plant Science and Biotechnology, Rivers State. Nutrient and anti-nutrient quality were evaluated and Proximate composition analysis revealed highest (34.225 ± 0.005%) and lowest (0.2 ± 0.00%) content for moisture and fibre respectively. Mineral investigation showed phosphorous to be the highest mineral element (430 ± 0.00mg/100g) while iron recorded lowest value (0.3 ± 0.00mg/100g). Thiamine was the only vitamin seen and it recorded 0.66 ± 0.05. A total of eight anti-nutrients (glycoside, oxalate, saponin, tannin, carotenoid, polyphenol, flavonoid and lignans) were found. Highest anti-nutrient value (3.85±0.05%) was recorded for polyphenol whereas tannin recorded lowest value (0.005 ± 0.0005%). Generally, A. judae has appreciable nutrients and anti-nutrients and its consumption, cultivation and utilization should be encouraged.

Keywords: *Earmushroom (Auricularia auricula-judae), nutrient and anti-nutrient*

INTRODUCTION

Auricularia auricula-judae, is an edible mushroom with a variety of common names such as black fungus, wood ear or ear mushroom as a result of its shape and colour (Montoya-Alvarez *et al.,* 2011). The mushroom is mostly found in the wild, although few literature show its domestication and cultivation (Dai and Yang, 2008). Ear mushroom is widely distributed as it has been shown to be present in China, USA, Taiwan, Thailand, Philippines, Indonesia, Malaysia and several other countries(Looney *et al.,* 2013; Malysheva and Bulakh, 2014; Malysheva, 2010; Li, 2012). However, study has shown it to have originated from Europe (Wu *et al*., 2014).

The fruiting body of wood ear possesses unique morphological features which include cupped or floppy ear shape, size of 3cm to 12cm, short stalk, elastic texture that is tough and gelatinous and a reddish-brown colouration (Onyango *et al.,* 2011; Moa, 1998). Microscopic feature includes a long sausages shape spore that maybe white, yellowish or cream in colour (Worral *et al.,* 1997).

The mushroom has a unique ecology as it grows mainly on older trees and shrubs that are deciduous in nature or dead and decaying branches (Yoona *et al.,* 2003). It is predominantly found in evergreen forests and mostly gregarious as they grow in clusters at varying sizes, colour and shape (Stamet, 1993).

Wood ear is a good source of nutrient as literatures have shown it to posses protein, carbohydrate, fibre, ash, calcium, phosphorus, potassium, magnesium, sodium, iron, vitamins A, B, C, E and K (Kadnikova *et al.*,2015; Choudhury and Sarma, 2014; Boa, 2004). Early studies have also shown the mushroom to contain anti-nutrients such as polyphenol, flavonoid, saponin, oxalate, tannin and glycosides (Oli *et al.*, 2020; Lu *et al.*, 2018).*Auricularia auricula-judae* also serve as a source of food and income to many as it prepared into a variety of delicacies and commercialized respectively (Yu *et al.*, 2014; Francia *et al.*, 2003).

However, there are still some challenges that affect this important mushroom and they include poor knowledge of its edibility, constant destruction of their habitat in the wild by man and pests and diseases (Adedokun and Ataga, 2006; Chang and Miles, 1991; Roberts and Hajek, 1993).

Hence, this research was embarked upon to assess the nutrient and anti-nutrient compositions of *Auricularia auricula-judae* found in Port Harcourt, Rivers State.

MATERIALS AND METHODS

Sample Collection

Healthy samples of ear mushroom (*Auriculariaauricula-judae*) were collected from decaying mango wood from Road B, Rivers State University campus, Rivers State. They were immediately transported to the Department of Plant Science and Biotechnology, Rivers State University for further studies.

Determination of nutrient and anti-nutrient components of ear mushroom

Healthy fruiting bodies of ear mushroom were sent to the Plant Science and Biotechnology Laboratory for the determination of nutrient composition. The methods of AOAC, (2005) was used for the determination of proximate (moisture, ash, fibre, protein, carbohydrate and lipid), mineral (calcium, phosphorus, potassium, sodium, magnesium and iron), vitamin (thaimin) and anti-nutrients (glycoside, oxalate, saponin, tannin, carotenoid, polyphenol, flavonoid, and lignan) compositions. All analysis were done in triplicate.

Statistical Analysis

Data obtained were subjected to mean and standard deviation analysis with the aid of SPSS software version 25.

RESULTS AND DISCUSSION

Table 1: Mineral and Vitamin compositions of *A. judae*

Parameters	Composition (mg/100g)
Calcium	220 ± 0.00
Iron	0.3 ±0.00

Magnesium	225 ± 5
Phosphorous	430 ± 0.00
Potassium	120 ± 0.00
Sodium	62 ± 0.00
Thiamine	0.66 ± 0.05

Table 2: proximate composition of*A. judae*

Parameters	**Composition**
Moisture	34.225 ± 0.005
Ash	1.1 ± 0.1
Lipid	0.5 ± 0.00
Fibre	0.2 ± 0.00
Carbohydrate	21 ± 0.00
Protein	19 ± 35 ± 0.15

Table 3: Anti-nutrient composition of *A. judae*

Parameters	**Composition**
Glycoside	0.002 ± 0.001
Oxalate	0.01 ± 0.00
Saponin	0.7 ± 0.00
Tannin	0.005 ± 0.0005
Carotenoid	0.541 ± 0.499

Polyphenol	3.85 ± 0.05
Flavonoid	1.2 ± 0.00
Lignans	2.41 ± 0.01

The result of mineral and vitamin composition of *A.judae* presented in table 1 showed the presence of calcium, iron, magnesium, phosphorous, potassium, sodium and thiamin. The findings of the current study has shown *A. judae* to contain appreciable concentration of mineral element. Phosphorus recorded highest value (430 ± 0.00) of mineral while lowest value (0.3 ± 0.00) was recorded for iron. Several research and studies have shown different edible mushroom including *A. judae* to be a good source of vitamins (Choudhury and Sarma, 2014; Boa, 2004).

The mineral values recorded in this study are lower than those reported by Kadnikova *et al.*, (2015). Yao *et al.*,(2019) also reported higher values of magnesium and iron *thean* the correspondents in the current study. Notwithstanding, Okwulehie and Ogoke, (2013) reported lower values of mineral in *A. Judae* than those recorded in the current study. Mineral elements are crucial to our daily living, hence consumption of mineral containing food is advocated. The present study has shown *A. judae* to containing these minerals that have been implicated by early researchers to aid biological and metabolic synthesis and processes (Adeduntan, 2014).

The current study also showed thiamine to be present in *A.judae*. However, scanty literature has shown *A. judae* to contain other vitamins. Rebecca *et al.*, (2020) also reported only vitamin to be present in *A. orneaa*. In addition, Rahman *et al.*, (2020) reported only vitamin C to be present in *A. judae*. The limited availability of vitamins in *A. judae* in the current study does not rule out the vital role vitamin plays in human health, as vitamins are essential support to the immune system (Samsudin and Abdullah, 2019).

The proximate composition result of *A. judae* presented in table 2 revealed moisture, ash, lipid, fibre, carbohydrate and protein to be present. Literatures have indicated the availability of several nutrients contents in *A. judae* and the current study is not an exemption. Highest nutrient value was recorded for moisture (34.225 ± 0.005), whereas fibre recorded lowest value (0.2 ± 0.00). kadnikova *et al.*, (2015) and Okwulehie and Ogoke, (2013) also reported same proximate nutrients in different edible mushrooms as well as *A. judae*. Shan *et al.*, (2019) reported higher contents of protein, ash and lipid than those recorded in the present study. Yao *et al.*, (2019) also reported higher proximate nutrient concentration for *A. judae* cultivated in different substrates. Although, they further reported lower moisture content. Sifat *et al.*, (2020) reported similar protein content for *A. judae* as compared to that recorded in the current study. The moisture result of the present study disagrees with the report of Rahman *et al.*, (2020) as they reported lower moisture values for three strains of *A. judae* assessed. The nutritional differences in proximate composition could be as a result of the environment and the time assessed as biological organisms are influenced by environment and as well the genetic makeup (Afiukwa *et al.*,2015; Boa,2004).

Food nutrient contributes to the well-being of man as well as providing energy (carbohydrate) for daily activities (Khaskholi *et al.*, 2014; Baridara *et al.*, 2019).

The result of anti-nutrient composition of *A. judae* presented in table 3 recorded glycoside, oxalate, saponin, tannin, carotenoid, polyphenol, flavonoid, and lignans to be present. Anti-

nutrients are essential components of plant and other living plant-like bodies (Romero *et al.*, 2018). The current study has further supported this knowledge as several anti-nutrient was recorded. Highest and lowest values of anti-nutrient (3.85 ± 0.05 and 0.0005 ± 0.0005) were recorded for polyphenol and tannin respectively. Early researchers have also indicated the occurrence of same anti-nutrients to be present in edible mushrooms as well as *A. judae* (Shan *et al.*, 2019). Although, Sifat *et al.*, (2020) reported higher concentrations of flavonoid, phenol and tannin compared to those recorded in the present study. Higher flavonoid content was also reported by Yao *et al*, 2019 for *A. judae* cultivated on different subtracts. However, the flavonoid value of the current study is higher than that reported by Adeduntan, (2014) for *A.* judae. in addition, Okwulehie and Ogoke, (2013) also reported lower values of saponin and flavonoid than their equivalents in the present study. Generally, mushrooms as well as *A. judae* play a major role in the society as they do not only secure as food but also as good degrading agents, source of income and medicinal too (Galic *et al.*, 2020; Agbagwa *et al.*, 2020). Notwithstanding, literatures have implicated *A. judae* to portray anti-microbial, anti-diabetic and anti- oxidant properties as a result of these anti-nutrient present in it (Rahman *et al.*, 2020; Oli *et al.*, 2020; Lu *et al.*, 2018).

CONCLUSION

The ear mushroom (*A. judae*) is easily accessible in the wild within the southern part of Nigeria. The current study has shown the edible mushroom to be a good source of nutrient and anti-nutrient. Further studies on*A. judae* cultivation within the region should be encouraged as it is mostly found in the wild.

REFERENCES

Adedokun, O.M. and Ataga, A.E. (2006). Effect of crude oil and oil products on growth of some edible mushrooms. *Journal of Applied Science and Environmental Management*, 10(2):91-93.

Adeduntan, S. A. (2014). Nutritional and Anti-nutritional characteristics of some dominant fungi species in south western Nigeria. *International Journal of Engineering and Science,* 3(6):18-24.

Afiukwa C. A., Ebem C. E. and Igwe D.O. (2015). Characterization of the proximate and amino acid composition of edible wild mushroom species in Abakaliki, Nigeria. *AASCIT Journal of Bioscience,1(2):20-25.*

Agbagwa S. S., Chuku E. C. and Wekhe, O. (2020). Assessment of anti-nutrient and vitamin compositions of *plaurotus ostreatus* cultivated on three waste materials. *International Journal of Research in Agriculture, Biology and* Environment, 1 (2): 16-21.

AOAC, (2005). Official methods of analysis of AOAC international, 18th edition. Association of official analytical chemists, Washington, D.C., USA.

Bandara A.R., Rapior S., Mortimer P. E., Kakwumyan P., Kelvin D. Hyde K. D and Xu J. (2019). A review of the polysaccharide, protein and selected nutrient content of *Auricularia*, and their potential pharmacological value. *Mycosphere*,10(1):579-607.

Boa, E.(2004). Non-wood forest products: wild edible fungi, a global overview of their use and importance to people. FAO, Rome, Italy. pp145.

Chang, S.T. and Miles, P.G. (1991). Recent trends in world production of cultivated edible mushrooms. *The Mushroom Journal,* 503: 15-18.

Choudhury, M. P. and Sarma, T. C. (2014). Studies on Ear fungus *Auricularia* from the woodland of Nameri National Park, Sonitpur district, Assam. *International Journal of Interdisciplinaryand Multidisciplinary Studies,* 1(5):262-265.

Dai, Y.C and Yang, Z.L. (2008) A revised checklist of medicinal fungi in China. *Mycosystema*, 27:801–824

Francia, C., Rapior, S., Courtecuisse, R. and Siroux, Y. (1999). Current research findings on the effects of selected mushrooms on cardiovascular diseases. *International Journal ofMedicinal Mushrooms,* 1 (2): 169–72.

Galic M., Stajic M., Vukojevic J. and Cilerdzic J. (2020). Capacity of*Auricularia auricula-judae* to degrade agro-forestry residues. *Cellulose Chemistry andTechnology*, 54(1-2):179-184.

Kadnikova I. A., Costa R., Kaleink T.K., Guruleva O. N. and Yanguo S. (2015). Chemical composition and nutritional value of the mushroom *Auricularia auricula-judae.* Journal *of Food and Nutrition* Research, 3(8):478-482.

Khaskheli S. G., Zheng W., Sheikh S. A., Liu Y., Khaskheli A. A. and Huang W. (2014). Effects of rehydration ratio on the quality of *Auricularia auricula-judae* mushroom. *Journal of Food and Nutrition Research*, 2(8):469-475.

Li, Y. (2012). Present development situation and tendency of edible mushroom industry in China. *Mushroom Sci*ence, 18: 3-9.

Looney, B., Birkebak, J., and Matheny, P.B. (2013) Systematics of the genus Auricularia with an emphasis on species from the southeastern United States. *North American Fungi,* 8:1–25.

Lu A., Fang Z. shen M., Xu Y. YuM., Wang S., Zkang Y., and Wang W. (2020). Antidiabetic effects of the *Auricularia auricula* polysaccharides simulated hydrolysates in experimental type-2 diabetic rats. *Natural product communications,* 13(2): 195-200.

Malysheva, V.F. (2010) Rare and interesting species of heterobasidiomycetes from Russia. Fungi non delineati. *Pars LIII. Edizioni Candusso I. Alassio* - (SV). pp 92.

Malysheva, V.F. and Bulakh, E.M. (2014) Contribution to the study of the genus *Auricularia* (Auriculariales, Basidiomycota) in Russia. *NovostiSistematiki Nizshikh Rastenii,* 48:164–180.

Mao, X.L. (1998). Economic fungi of China. *Molecular Phylogenetic Evolution*, 35:1–20.

Montoya-Alvarez, A.F., Hayakawa, H., Minamya, Y. and Fukuda, T. (2011) Phylogenetic relationships and review of the species of Auricularia (Fungi: Basidiomycetes) in Colombia. *Caldasia*, 33:55–66.

Okwulehie, I. C. and Ogoke J.A. (2013). Bioactive, nutritional, and heavy metal constituents of some edible mushrooms found in Abia State of Nigeria. *International Journal of Applied Microbiology and BiotechnologyResearch,1:7-15.*

Oli A. N., Edeh P.A., Al-Mosawi R.M., Mbachu N. A., Al-dahmoshi O.M., Al-khafaji N.S.K., Ekuma U.O., Okezie M.U. and Saki M. (2020). Evaluation of the phytoconstituents of *Auricularia auricula-judae* mushroom and antimicrobial activity of its protein extract. *European Journal of Integrative Medicine*, 38:101176.

Onyango, B. O., Palapala, V. A., Arama, P. F., Wagai, S. O. and Gichimu, B. M. (2011). Suitability of supplemented substrates for cultivation of Kenyan native wood ear mushrooms (*Auricularia auricula*). *American Journal of Food Technology*, 6: 395-403.

Rahman M. A., Masud A., Lira N. Y. and Shakil S. (2020). Proximate analysis, phytochemical screening and antioxidant activity of different strains of *Auricularia auricula-judae* (Ear mushroom).*International Journal of Traditionaland Complementary Medicine*, 5:29.

Rebecca R. J., Zhang J., Zhao W.,Liu Y., Wang S. (2020). Compositional and nutritional inventory of nationally mutant strain. *Auricularia cornea* var. Li. edible mushroom from China. *Progress Nutrition*, 22(1):323-329.

Roberts, D and Hajek, M. (1993). Entomopathogenic fungi as bioinsecticides. In: Leatham,G.F.(ed.), Frontiers in industrial mycology. Chapman and Hall, New York. Pp 145-159.

Romero J. C. J. N., Ramos M. R. R. F., Tantengco O. A. G. T. and Medina P. M.B. (2018). Sex differences in the effect of *Auricularia auricula-judae* ethanolic extracts on the life span of *Drosophila melanogaster* during stress and non-stress conditions. *JournalAppliedPharmaceutical Science*, 8(11):087-094.

Samsudin, N, I. P. and Abdullah, N. (2019). Edible mushrooms from Malaysia; a literature review on their nutritional and medicinal properties. *International FoodResearch Journal*, 261(1):11-31.

Shan H., Sun X. D., Yang H. C., Liu F.Y., Wang B., Chai L., and Luan J. (2019). Proximate composition and bioactive compounds of cultivated and wild *Auricularia auricula* from North eastern China. *European Journal of Nutrition and Food Safety*, 11(4):175-186.

Sifat N., Lovely F., Zihad S. M. N. K., Hossain G. M. D., Shilpi J. A., Grice D. I., Mubarak M.S. and Uddin S. J.(2020). Investigation of the nutritional value and antioxidant activities of common Bangledeshi edible mushrooms. *Clinical Phytoscience*, 6:88.

Stamets, P. (1993). Growing gourmet and medicinal mushrooms. Ten Speed Press, Berkeley, 56p.

Worrall, J. J., Anagnost, S. E. and Zabel, R. A. (1997). Comparison of wood decay among diverse lignicolous . *Mycologia*, 89 (2): 199–219.

Wu, F., Yuan, Y., Malysheva, V.F., Du, P., and Dai, Y.C. (2014). Species clarification of the most important and cultivated *Auricularia* mushroom *A. heimuer*: evidence from morphological and molecular data. *Phytotaxa*, 186:241–253.

Yao H., Liu Y., Ma Z. F., Zhang H., Fu T., Li Z., Li Y., Hu W., Han S., Zhao F., Wu H. And Zhang X. (2019). Analysis of nutritional quality of black fungus cultivated with corn stalks. *Journal of Food Quality*,9590251.

Yoona, S.J., Yub, Myeong, A., Pyunb, Y.R., Hwangb, J.K., Chuc, D.C., Juneja, L. R. and Mourão, Paulo A. S. (2003). The nontoxic mushroom *Auricularia auricula* contains a polysaccharide with anticoagulant activity mediated by antithrombin. *Thrombosis Research,* 112 (3): 151–8.

Yu, J., Sun, R., Zhao, Z. and Wang, Y. (2014). *Auricularia polytricha* polysaccharides induce cell cycle arrest and apoptosis in human lung cancer A549 cells.*International Journal of Biological Macromolecules,* 68: 67–71.