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Original Research Article

Proximate and Antinutrient Content of *Pleurotus Ostreatus* (Jacq.) P. Kumm Found In Akwa Ibom State, Nigeria

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ABSTRACT

Nutritional evaluation of *Pleurotus ostreatus* (Jacq.) P. Kumm found in Akwa Ibom state, Nigeria was analyzed in this work for the nutrients present in the edible mushroom; *Pleurotus ostreatus* as well as the antinutrients present. These antinutrients include Tannins, Phytate, Oxalate, and Hydrogen Cyanin which when in high quantity can cause health hazards to humans such as poor protein digestibility and reduction in growth. This work, however, showed that antinutrients occur in moderate amounts in *Pleurotus ostreatus*. The difference in the structure of these mushrooms is as a result of the differences in the environmental conditions and the substrate.

Keywords: Antinutrients, Hydrogen Cyanin, Oxalate, *Pleurotus ostreatus*, Proximate and Tannin.

INTRODUCTION

Pleurotus ostreatus also known as oyster mushroom is a common edible mushroom. *Pleurotus ostreatus* was first cultivated in Germany as a subsistence food measure during the First World War. [1] This mushroom is seen to grow on dead woods thus making them saprophytes, although they can also be cultivated on food source such as sawdust, lignocelluloses waste etc. These mushrooms usually differ from one another in terms of the structure of the body and also as a result of the differences in the environmental conditions. This mushroom is generally reported to have been first cultivated in 1936 by Kaufert. *Pleurotus ostreatus* can be used industrially for mycoremediation and it is also used as a medicinal mushroom because it contains lavastain. This compound lavastain, aids in reducing cholesterol in the human body system. [2] Amongst the mushroom species, *P. ostreatus* is relatively rich in protein, zinc, and iron. Primarily, mushrooms are used as food for human consumption. They are also used as a source of income. They are used industrially to degrade contaminants present in the environment. *Pleurotus ostreatus* contains mineral salt required by the human body and so are applied as an antioxidant. They also aid in decomposition of dead woods.

The objective of this study is to determine the nutritional qualities and

antinutrients composition of the *P.ostreatus* and also to compare their nutritional composition from the different environments if any.

MATERIALS AND METHODS

Study Area

The mushroom, *Pleurotus ostreatus* was gotten from five (5) different locations in Akwa Ibom State. The variation in the location and also environment in a way leaves them with a slight or no differences in the structure of the mushrooms. These five samples were collected from ObongItam (Etim Ekpo Local Government Area), Mbiaobong Ibat (Ini Local Government Area), Atan Offot (Uyo Local Government Area), Mbioto 1 (Etinan Local Government Area) and Oboetim (Nsit Ibom Local Government Area) respectively all in Akwa Ibom State, Nigeria.

Akwa Ibom State is one of the South South States in Nigeria and is located between latitude $4^0\ 31^1$ and $5^0\ 53^1$ North and longitude $7^0\ 51^1$ and $8^0\ 25^1$ East. It covers a total land area of 8,412km². [3] Its proximity to the sea makes the state generally humid. The mean annual temperature is between 26°C and 29°C. Maximum humidity is recorded in July, while minimum occurs in January. [4]

Sample Collection

Sample A was gotten from Obong Itam in Etim Ekpo Local Government Area during the early hours of the morning between 7-8 am from a dead mango tree in a land that has been left fallowed for about four years. The mushroom appeared whitish with a broad pileus, a short stipe that ranged between 3-4cm long and the gills arranged beneath the pileus. The mushroom was fleshy and thick with the end of the tip having a brown to dark colour.

Sample B was gotten from Mbiaobong Ibat and Sample C was gotten from Atan Offot in the early hours of the morning from a tree that had been cut down in a cultivated farmland where plants like *Zea may*, *Manihot esculentus* were being cultivated. The mushroom was gotten from *Spondias mombin* tree and it appeared milky with a broad pileus, gills arranged beneath the pileus and having a short stipe with a dark coloured end.

Sample D (gotten from Mbioto 1) and Sample E (gotten from Oboetim) were gotten in the early hours from a dead pear tree. Pileus was broad, gills arranged beneath the pileus. The stipes was very short. The mushroom was milky with a short dark stipe.

Sample Preparation

The mushrooms were washed with tap water. The residual moisture was evaporated at room temperature, thereafter the mushrooms were oven dried at a constant temperature of 80˚C for some minutes. The dried mushrooms were then ground and stored in air tight containers with plastic cover. These powdered samples were used to carry out proximate and antinutrients analysis.

Proximate Analysis

The moisture content of the five (5)powdered samples were determined separately by drying 2g of the powdered sample in an oven at 105ºC until the constant weight was obtained. [4]

Ash was determined according to the method described. [5] The samples were ignited to ashes in a muffle furnace at about 500-600ºC until grayish white ash was obtained.

Crude protein was determined by Kjeldahl's method. Lipids were determined by the method of. [6] This involves the use of soxhlet apparatus and petroleum etheras a solvent.

Fibre content of the powdered samples were obtained by acid-base digestion with 1.25% H_2SO_4(w/v) and 1.25% NaOH(w/v) solutions.

Available carbohydrate was obtained by calculating the difference obtained after subtracting total organic nitrogen (protein), lipid, ash, and fibre from 100. [7,8]

The caloric valve was obtained by multiplying the value of the crude protein, lipid and CHO by 4, 9, 4 kcal respectively and taking the sum of the product.

Antinutrients Analysis

Oxalate, Phytate, hydrogen Cyanin and Tannin content in the powdered plant samples were determined.

Oxalate was determined by titration. The samples were first digested using NHCL and the mixture was heated in a water bath at 50ºC for two hours. Secondly, the samples were heated in 50ml of the filtrate with some reagents like NH_2OH and $CaCL_2$ resulting in the precipitation of oxalate. Then, lastly by permanganate titration with the sample against 0.05 $KMNO_4$solution till a faint pink colour appeared which persist for 10seconds.

Phytate was determined using. [9] This involves using the formula MgP_A= 2×660.8.

Tannins were determined using the Folin-Dennis spectrometric method as described by. [10] The available tannins was calculated by;

%Tannins= AN/AS ×C×100/10 ×VF/VS

Where; AN=absorbance of test sample

AS= absorbance of standard solution

C= conc. Of std solution

W= weight of sample

VF= total vol. of extract

VA= volume of extract analyzed

Hydrogen cyanin was determined using alkaline picrate method and the available hydrogen cyanin was calculated by;

$$\frac{\text{Abs. test} \times \text{conc. Std}}{\text{Abs.std} \times \text{vol. of sample}} \times \frac{100}{1}$$

RESULTS

The result of the proximate analysis obtained for the five (5) *Pleurotus ostreatus*gotten from five (5) different locations are showed in Table 1.From these results; the moisture content ranged from 65.23±0.48 in sample D which recorded the highest value to 62.41±1.3932 in Sample C which had the lowest moisture content. Protein was found in high levels and varied between 11.61±0.51 in Sample C and 9.83±0.85 in Sample B. Fat content ranged from 5.72±0.43in Sample D and 5.1±0.16 in Sample A. Carbohydrates, calculated by difference were also in abundance and ranged from 77.56±0.21 in Sample D and 70.02±0.12 in Sample E. Ash arranged from 4.28±0.62 in Sample, 5.06±0.94 in Sample B and 5.18±0.71 in Sample C. Fibre varied between 3.09±0.07 in Sample A and 3.71±0.51 in Sample B. The highest value of energy was found in Sample A with 394.57±0.27 while Sample E gives the lowest energy contribution with 342.51±0.41.

Table 1: Proximate Composition of *Pleurotus ostreatus*gotten from five (5) different locations in Akwa Ibom State.

S/N	SAMPLE ID	MOISTURE	ASH (%)	FIBRE (%)	LIPIDS (%)	PROTEIN (%)	CHO (%)	CALORIC VALUE (Kcal)
1	A	64.34±0.32	4.28±0.62	3.09±0.07	5.1±0.16	11.27±0.21	74.88±0.46	394.57±0.27
2	B	63.55±0.53	5.06±0.94	3.71±0.51	4.84±0.47	9.83±0.85	72.54±0.56	383.59±0.81
3	C	62.41±1.39	5.18±0.71	3.20±0.78	4.40±0.64	11.61±0.51	72.08±0.45	379.42±5.99
4	D	65.23±0.48	4.89±0.72	3.77±0.56	5.72±0.43	10.92±0.71	77.56±0.21	381.45±0.22
5	E	58.73±0.43	6.32±1.21	3.98±0.21	4.65±0.83	10.21±0.22	70.02±0.12	342.51±0.41

Results of the antinutrients analysis in the five (5) different samples of *Pleurotus ostreatus* showed that there was no trace of Hydrogen cyanin in the five samples (Table 2). Oxalate content varied from 16.69±0.65 in Sample C and 30.19±0.49 in Sample B. Phytate ranged from 0.57±0.31 in Sample B and 1.09±0.21 in Sample A. Tannin ranged

from 0.0004±0.0002 in samples A and B, 0.0008±0.0004 in Sample C, 0.0006±0.0003 in Sample D and 0.0004±0.0004 in Sample E.

Table 2: Antinutrients Composition of *Pleurotus ostreatus* gotten from five (5) different locations in Akwa Ibom State.

S/N	SAMPLE ID	HCN	OXALATE	PHYTATE	TANNINS
1	A	BDL	21.80 ± 0.20	1.09 ± 0.21	0.0004 ± 0.0002
2	B	BDL	30.19 ± 0.49	0.57 ± 0.31	0.0004 ± 0.0002
3	C	BDL	16.69 ± 0.65	0.65 ± 0.47	0.0008 ± 0.0004
4	D	BDL	17.45 ± 0.64	0.83 ± 0.56	0.0006 ± 0.0003
5	E	BDL	27.21 ± 0.56	0.87 ± 0.71	0.0004 ± 0.0004

DISCUSSIONS

Mushrooms are consumed for their nutritive content as well as their medicinal values. [11] From the results obtained in this research, moisture content in sample Dwas higher than that of sample A, B, C and E. This shows that the substrate from which it was obtained contains high volume of moisture compared to the other substrates. Moisture is also seen as water and is very essential to plant and, the content to life generally. Mushrooms are generally high in their moisture content being approximately 90% of their fresh weight. [12] This is in line with the work of [13] who carried out a research on four species of edible mushrooms namely, *Pleurotus ostreatus*, *Pleurotus sajour-caju*, *Pleurotus florida* and *P. hk-5* and recorded their proximate compositions. The report showed that these species of mushroom have high moisture content. Mushrooms are generally known to have high moisture content. The fibre content in this mushroom was found to be in a comparable range with a relatively high value in Sample E and D than Sample A, B and C. Mushrooms are valuable sources of fibre. [14] This fibre when digested in a correct proportion helps to prevent heart disease, and can improve digestive health. Edible mushrooms are considered to be a good source of digestible protein. [15] Proteins generally when consumed helps to keep the immune system functioning and helps the body to produce enzymes. In this study, the protein content was found to be relatively high in sample C and A. This sample was gotten from a dead pear tree showing that the substrate accumulated a lot of protein within its tissues and thus this enabled the mushroom to grow well. Carbohydrate is another important food nutrient. It provides the body with a source of fuel and energy and aids in proper working of the brain, heart digestive system and immune system. High content of carbohydrate is recorded in this study in the five (5) samples. However, Sample D and A shows a relatively high carbohydrate content compared to sample B, C and E. Sample D and A recorded higher Lipid or fat content than that of Samples B, C and E. Their primary purpose in the body is to store energy which is long term and acts as substitute when the available energy in the body is exhausted. *Pleurotus ostreatus* have no cholesterol and are virtually low in fat. All fresh mushrooms are free of fat. The fat content of edible mushrooms consists of unsaturated fatty acids which are less hazardous to health than the saturated fatty acids of animal fats. [15] Ash content in this study was highest in Sample E and C. The energy level was found to be highest in sample A and B and lowest in sample C. However, the five (5) samples contain a reasonable amount of energy capable of sustaining the body system when consumed.

All these are in line with the works of [16] who carried out a study on nutritional value and biomass yield of *P. ostreatus* grown on different waste. The result showed that the most favourable cultivation substrate was the mixture of rice and wheat straw. The mixture achieved the highest percentage of fat (3.9%), protein(39.1%),

fibre (6.9%), followed by the rice straw which achieved a high percentage in moisture (90.1%), CHO (58.7%). Total ash ranged from 6.0% - 6.5% in rice, wheat and paddy straw respectively. Also, [17] worked on the nutritional value of *Pleurotus ostreatus* and the result revealed that the nutrient varied according to the substrate composition. The moisture content in soybean straw, paddy and wheat were in the range of 88. 51-88.59% and protein content ranged from 21.00- 24.66% respectively. Crude fibre contained in the mushroom ranged from 7.15-7.70%. Available carbohydrate was in the range of 53.20- 55. 33% and the ash content ranged between 6.30- 6.70% respectively.

Antinutrients are natural or synthetic compounds that interfere with the absorption of nutrient. In this study, some of this toxic substances were identified such as Hydrogen cyanin which was absent in all five (5) samples. Oxalate was high in all five samples with the highest value recorded in sample B and E. This oxalate though not harmful in trace amount can bind calcium and prevent its absorption in the human body when its presence in the body is high. Phytate prevents the body from absorbing mineral by binding them and creating a new unrecognizable compound. [18] From this research, this Phytate was found in trace amount in these mushrooms. Tannins were also found in trace concentration. Recent studies show that small amount of tannin maybe beneficial. Nevertheless, antinutrients intake should be monitored and in most cases decreased.

CONCLUSION

From the result obtained in this research, it can be concluded that there are slight variations in the nutrient composition of this five (5) samples of the mushroom *P. ostreatus*. It is important to note that this variation depends on those environmental factors such as temperature, rainfall, and humidity, in the environment of these mushrooms. However, the substrates on which they grow also contribute to their differences. Moreover, these five samples of *Pleurotus ostreatus* still show a good proportion of the nutrient thus contributing to the food value of our habitual diet.

It is recommended that the *Pleurotus ostreatus* be consumed by all age groups for its high nutrient content especially by those having hyperacidity and constipation.

REFERENCES

1. Eger, G., Eden, G and Wissig, E. *Pleurotus ostreatus* - breeding potentials of a new cultivated mushroom. *Theoretical and Applied Genetic,*1976; 47:155-163.
2. Gunde-Cimerman, N. and Cimerman, A. *Pleurotus* fruiting bodies contain the inhibitor of 3-hydroxy-3 methylglutaryl-coenzyme A reductase-lovastain. *Experimental Mycology,*1995; 19(1) 1-6
3. AKSG. Geography and Location. About Akwa Ibom State. www.aksg.online.com. 2012.
4. AOAC. Official Methods Of Analysis of AOAC International. 7th edn. Vol 11, AOAC Graithenbeery MD, USA, 2005; pp;920 – 968.
5. Chang, S. T.*Cultivated mushrooms.* Handbook of Applied Mycology,1991; pp.3:221-240.
6. AOAC. Official Methods of Analysis of AOAC International. 7th edn. Vol 11, AOAC Graithenbeery MD, USA, 1990; pp; 920 – 968.
7. Cella, J. H. and Watson, J. Manual of Laboratory Test, 1st Indian Edition. New Delhi, India: A.I.T.B.S. Publishers & Distributors. 2000; pp. 244 - 265.
8. Adepoju, G. K. A. and Odubena, O. O. Effect of *Mucunapruriens* on Some Haematological and Biochemical Parameters. *Journal of Medicinal Plants Research,* 2009; 3(2): 73 - 76.
9. ÇaLanmark, N. The nutrient of exotic mushroom (*Lentinulaedodes* and

Pleurotus species) and an estimated approach to the volatile compounds. *Food Chemistry*, 2007; 105:1188- 1194.
10. Kaufert, F. The biology of *Pleurotus corticatus* Fries. *Minnesota Agricultural Experimental Station*1936; Bullentin 114.
11. Cheryan, M. andRakis, J. Phytic acid interaction in food system. *Crit. Rev. Food Science Nutr.*1980; 13(4): 297 – 335.
12. Stamet, P. Growing Gourmet and Medicinal Mushrooms, Berkelry/Toronto;Ten speed press. 2005; p.56.
13. Selvaraji, Y. *et al*. Volatile flavor component of dry milky mushrooms. *Flavour and Fragrance Journal*, 2005; 20(6):715- 714.
14. Breene, W. Nutritional and Medicinal Value of Specialty Mushroom, *Journal of Food Production*, 1990; 53:883-894.
15. Yehia S. R. Article on Nutritional Value and Biomass yield of the edible mushroom *Pleurotus ostreatus* cultivated on different waste in Egypt. Department of Botany, Faculty of Science, Cairo University, Egypt. 2012; Vol. 11.
16. Patil, S. S, Ahmed, S. A.,Telang, S. M. and Baig, M. M.The Nutritional Value of *Pleurotus ostreatus* cultivated on Different lignocellulosic Agrowastes. Innovative Romanian Food Technology, 2010; Vol. 7, p.6676.
17. Cheryan, M. and Rakis, J. (1980) Phytic acid interaction in food system. *Crit. Rev. Food Science Nutr*. 13(4): 297 – 335.
18. Ann, E. The Tannins Handbook. Department of Chemistry and Biochemistry, Miami University Oxford. OH 45056, USA. 1988; pp. 453.

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