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Influence of sporophores maturity on nutritional composition of *Psathyrella atroumbonata*, pegler; A Nigerian edible fungus

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ABSTRACT

Proximate analyses were carried out on *Psathyrella atroumbonata* during different stages of sporophores development (i.e young, matured and old fruitbodies). The stipe, gills and pileus of young fruitbodies of *P. atroumbonata* had very good (significant) protein values of 19.67, 19.08 and 18.70 mg/100g respectively (P=0.05)when compared with matured and old carpophores. Matured sporophores of *P.atroumbonata* had protein contents of 17.60,17.50 and 17.49 mg/100g in thier stipe, gills and pileus respectively, while low protein content were detected in the old fruitbodies of this fungus (P=0.05). The pileus, gills and stipe of old *P. atroumbonata* sporophores contained significantly higher levels of crude fibres (12.60, 12.50 and 12.40 mg/100g) than the matured and young corresponding parts this fungus. The highest ash content (10.30mg/100g) was obtained in the young fruitbodies of *P.atrombonata*. Similarly, the greatest carbohydrate content (8.60mg/100g) was obtained in young fruit body of *P. atroumbonat*. It was also observed that the young fruitbodies of this fungus possessed high concentration of moisture in their gills (90.71%). Different parts of *P. atroumbonata* sporophores (especially when young) were also found to contain essential mineral elements such as Ca,Mg.K,N,P,Fe and Zn. The significance of these findings were discussed in relation to human health.

KEYWORDS

Sporophores;
Pileus;
Gills;
Stipe;
Nutrients;
P.atroumbonata.

INTRODUCTION

Mushrooms are non-green, spore-bearing, fleshy, sometimes tough or leathery, umbrella-like sporophore of a fungus that bears their basidia on the surface of gills[6, 8, 13]. They contain no chlorophyll and obtain their food from metabolizing non organic materials in to simple absorbable substances, by utilizing a wide range of extracellular enzymes[21, 23].

The word 'mushroom' is most often applied to those fungi that have a stipe, a pileus, and lamellae, but other higher fungi without these two features have been included[13, 23]. The body of mushrooms stores nutrients and other essentials compounds, and when enough materials are stored and the conditions are favourble, they fructify. All mushrooms belong to the fungi kingdom[6, 23]. In fact, they are amongst the largest fungi which have attracted the attention of naturalists even before the invention of microscopes or simple lenses[6]. Mushrooms could secrete enzymes such as cellulase,oxidase,

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hydrolase, amylase and laccase to break down latex, lignin, hemicellulose, cellulose and other components on the substrates where they grow to release carbon, hydrogen, nitrogen and minerals back into the ecosystem in a form useable energy by other organisms e.g. plant, insects and animals[1, 18].

Due to their nutritional and medicinal benefits[9, 12, 17]. the use of mushrooms as food condiments and additives is becoming very popular in human diets[2, 16]. They are known to be rich in proteins, sugars, crude fibre, amino acids, glycogen, vitamins and mineral elements but very poor sources of lipids i.e. if present[3, 10, 12]. Protein is an important food ingredient, which is used as an indicator of food quality. Generally, mushrooms have fairly high protein content, but the values may vary depending on the mushroom species, type of tissues, stages of development, substrate on which they are grown, cultural conditions of cultivation and method of analysis used[11, 20, 21].

Psathyrella atroumbona (Plate 1) is one of the common edible mushrooms in Nigeria. The fruit bodies develop in large numbers on fallen trees, logs of wood and wooden poles[14, 15]. *P.atroumbonata* and other indigenous mushroom species have not been commercially cultivated in Nigeria. The consumers of these mushrooms depend solely on collection from the wild during the rainy season. This method of mushroom collection is not dependable and could not be ascertained[14, 15]. *P.atroumbonata* has a well defined stipe which is whitish and about 5 – 9 cm long. The pileus is about 1.5 to 5 cm in diameter, light brown, conical or bell shaped and brittle. The spore print is pale brown in colour[13, 22]. The mushroom is similar to *Coprinus* in appearance but does not undergo auto-digestion as does *Coprinus*[13, 22]. There is scanty information in regard to nutritional values of *P. atroumbonata*

Mature mushrooms have always been thought to be more nutritive than the younger ones. Pileus of any stages of mushroom has been reported to be richer in food nutrient than other parts[5]. Therefore, the objective of this study was to evaluate the nutrient composition of *P. atroumbonata*, collected in the wild during different stages of sporophore development. This will definitely add to protein supplement in diet of Nigerian who could not afford the high cost of meat due to low standard of living

MATERIALS AND METHODS

Collection and preparation of samples

The fruitbodies of *P. atroumbonata* Pegler, were collected from the decaying wood of *Terminalia ivorensis* within the campus of university of Ibadan. Ibadan. Nigeria. The collected sporophores were sorted out into young, matured and old fruitbodies. Each fungus was further separated into stipe, gills and pileus the fruitbodies were dried at 55^0C for 72 hours and powdered in a laboratory with mortar and pestle.

Proximate composition and mineral nutrients determination

Samples were analyzed for different nutrients using the method of the Association of Analytical Chemists[4]. All analyses were carried out in three replicates. For mineral elements,1.0g of each mushroom part was separately digested using 1;5;1 mixture of percholric acid, concentrated HNO_3 and H_2SO_4 in a fume chamber. Each digested sample was made up to 20ml with deionized water and evaluated for metal in a Digital plane photometer using the procedures of Al-Kahtani[3]. Dilution of 1.25 was made for magnesium determination from the washed sample i.e. 100 ml flasks. After the dilution, it was then read on Atomic Absorption spectrophotometer (AAS) after standardized with Mg standard, Mn, Cu, Zn and Fe were read from the solution that remains in the 100ml flask and also read on AAS

Plate 1 : Young fruiting body of *Psathyrella atroumbonata*

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after standardized with respective elements.

Analyses of data

The data generarated were subjected to analysis of variance,while test of significance were carried out using Duncan'smultiple Range test (p=0.05)

RESULTS

TABLE 1 shows the proximate composition of *P. atroumbonata* during different stages of sporophores maturity. From the result obtained, general nutrient content reduces as the mushroom matures. The highest nutrient content was observed to be higher at the young stage of development (Plate 1) as compared to matured and old fruitbodies. Moisture content decreased from 90% in the young fruit body to 89% in moderately young fruit body and to 88% in old fruitbody. Protein content also reduced as the sporophores mature from 19.67 to 17.60mg/100g in young and old fruitbodies respectively. Ash content showed slight decrease as the sporophores matured from 10.30 to 9.0mg/100g and carbohydrates from 8.60 to 77.70mg/100g respectively. There was slight increase in dry matter from 9.84 to 10.01mg/100g.

TABLE 2 shows the mineral content of *P. atroumbonata* as the mushroom mature. From the result obtained, mineral element content decrease gradually as the sporophores mature except, in some minerals like magnesium, sodium and zinc. The highest mineral content was observed in the young fruitbodies as compare to the matured sporophores and old fruitbodies.

Calcium reduced from 3.30 to 0.50 µg/100g, potassium reduced from 46.01 to 42.70 µg/100g, phosphorus reduced from 16.80 to 14.30 µg/100g, magnesium increased from 4.43 to5.02 µg/100g Na and Zn also increased slightly. Iron and copper did not show any significant increase, 0.24% and 0.08% respectively.

TABLE 1 : Proximate composition (g/100g) of different stages of growth of *Psathyrella atroumbonata,*

Fruitbody	Parts	Moisture content	Dry matter content	Carbohydrate content	Protein content	Fibre content	Ash content
Young	Stipe	90.60a	9.84b	8.60a	19.67a	10.70c	10.30a
	Gills	90.71a	9.73b	8.70a	19.08a	10.50c	10.01a
	Pileus	90.01a	9.60b	8.00a	18.70b	10.71c	9.90b
Matured	Stipe	89.70b	9.87b	7.98b	17.60c	11.08b	9.98b
	Gills	89.20b	9.89b	8.03a	17.50c	11.52b	9.96b
	Pileus	89.10b	9.90b	8.89a	17.49c	11.89b	9.60b
Old	Stipe	88.90c	10.01a	8.00a	16.30d	12.40a	9.40b
	Gills	88.82c	10.00a	7.60b	16.70d	12.50a	9.30b
	Pileus	88.70c	9.98b	7.70b	17.60c	12.60a	9.00b

Data followed by the same letter(s) in the same column are not significantly different by Duncan's multiple range test (P= 0.05)

TABLE 2 : Mineral element composition (µg/100g Dry weight) of different stages of growth of *Psathyrella . atroumbonata*

Fruitbody	Parts	Ca	Mg	K	Na	P	Fe	Cu	Zn
Young	Stipe	3.30a	4.43b	46.01a	6.31b	16.80a	0.22c	0.08a	0.85b
	Gills	3.10a	4.31b	45.89b	6.30b	16.75a	0.23b	0.08a	0.82b
	Pileus	3.20a	4.20b	45.15c	6.30b	16.70a	0.24a	0.08a	0.80b
Matured	Stipe	2.59b	4.49b	44.01d	6.50b	15.89b	0.23c	0.08a	0.89b
	Gills	1.29c	4.89b	44.00d	6.48b	15.60b	0.23c	0.08a	0.87b
	Pileus	1.01c	4.90b	43.89e	6.40b	15.30b	0.24a	0.07b	0.87b
Old	Stipe	0.87c	4.98b	43.50e	7.92a	14.79c	0.23b	0.08a	0.91a
	Gills	0.79c	5.00a	42.89f	7.84a	14.56c	0.22c	0.07b	0.91a
	Pileus	0.05c	5.02a	42.70f	7.80a	14.30c	0.24a	0.08a	0.90a

Data followed by the same letter(s) in the same column are not significantly different by Duncan's multiple range test (P= 0.05)

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DISCUSSION

The young sporophores of P. *atroumbonata* had the highest protein content in its pileus. The protein content obtained for *P. atroumbonata* is similar to the results of *Termitomyces robustus* obtained by Fasidi and Kadiri[10]. Protein in this mushroom was considerably higher than that of *Lentinus subnudus* as observed by Aletor[5].

In addition, the protein content of *Psthyrella atroumbonata* was higher than the values reported for *Auricularia auricula, A. polytricha, Tremella fuciformis, Ganoderma lucidum, Calvatia cyathiformis* and *Poria cocos* by[5, 9]. The sporophores of old *P. atroumbonata* mushroom species contained more crude fibre in thier pilei than in their stipes. The young stipe and gills of *P. atroumbonata* contained significantly higher levels of ash than the matured and old sporophores. The ash levels obtained for the parts of *Psathyrella atroumbonata* were in agreement with the values obtained by[5, 7] for other mushrooms. The value obtained for this fungus agrees with the report of Fasidi and Kadiri[11, 12, 20] for *T.robustus,* but was lower than the value reported by Alofe[7], for *Lentinus subnudus*. Likewise, the lower ash content observed for matured and old fruitbodies *were* in agreement with those reported for *A. auricularia* and *A. polytricha* by[9]. The highest carbohydrate was obtained in young fruitbody of *Psathyrella atroumbonata*.

The gills of *P. atroumbonata* had higher levels of carbohydrate than their corresponding pilus and stipes. Moisture content was high in all the parts of young fruitbodies of *P. atroumbonata* but it decreases as the sporophores mature. This result is in line with the findings of Jonathan and Esho[16]. Generally, the moisture content was higher in their stipes than in gills and pilei of *P. atroumbonata*.

The concentration of potassium and phosphorus decreased in *P. atroumbonata,* as the sporophores develop .All other mineral composition like calcium, magnesium, sodium, manganese, iron, copper and zinc did not show significant increase nor decease during sporophores maturity. In conclusion *P. atroumbonata* is a very rich mushroom. All its parts have adequate essential nutrients in comparism with other mushrooms and vegetables.

CONCLUSION

It was obvious from this study that *P. atroumbonata* is a very rich mushroom containing high amount of protein and other food components in its sporophores. This edible fungus also contain essential mineral nutrients such as K,Ca,Mg,P,Na,Fe and Zn. The results also revealed that the young fruit bodies of this wild mushroom is richer than the matured and old carpophores. It is then advisable for the mushroom hunters in Nigeria to collect young fruitbodies in order to derive maximum nutritional benefit from this edible fungus. The consumption of young sporophores will definitely act as protein supplement in the diet.

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