

Chemical Profile of *Pleurotus tuberregium* (Fr) Sing's Sclerotia.

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ABSTRACT

The proximate and phytochemical composition of *Pleurotus tuberregium* (Fr) sclerotia was determined. Our results show that *Pleurotus tuberregium* (Fr) sclerotia is rich in protein (64.31% WW and 71.21% DW) and carbohydrate (20.00% WW and 22.15% DW), with moderate contents of ash (2.20% WW and 2.44% DW), and crude fiber (2.89% WW and 3.20% DW). The phytochemical screening revealed moderate phytate content and low alkaloids, flavonoids (aurones, chalcones, flavones, flavonols and leucoanthocyanins), and tannins. Therefore, *Pleurotus tuberregium* (Fr) sclerotia are a rich source of proteins, fibers and carbohydrates, and are potential source of nutraceuticals.

(Keywords: phytochemical screening, *Pleurotus tuberregium* (Fr) sclerotium, proximate composition)

INTRODUCTION

Pleurotus tuberregium (Fr) Sing, an edible basidiomycete, occurs in both tropical and subtropical regions of the world [Okhuoya and Okogbo, 1991]. It is a common mushroom in the southern part of Nigeria and forms large spherical to ovoid, subterranean sclerotia (or underground tuber) which sometimes measure up to 30 cm in diameter, in addition to a mushroom [Okhuoya and Okogbo, 1991; Fasidi and Olorunmaiye, 1994]. The mushroom looks somewhat like an oyster mushroom (*Pleurotus ostreatus*) except that, when mature, the cap curves upward to form a cup-like shape.

The sclerotium is dark brown on the outside and white on the inside, and is called 'katala' in Hausa, 'umoho' in Igede, 'usu, ike usu or ero usu' in Ibo and 'awu' in Igala, all in Nigeria. The fungus

infects dry wood, where it produces the sclerotium, usually buried within the wood tissues but also found between the wood and the bark.

In Nigeria both the sclerotium and the mushroom are eaten. The sclerotium, which is hard, is peeled and ground for use in a vegetable soup [Fasidi and Olorunmaiye, 1994]. In traditional medical practice in Nigeria, it is used in preparation of cures for headache, stomach ailments, colds and fever, asthma, smallpox and high blood pressure [Okhuoya and Okogbo, 1991; Fasidi and Olorunmaiye, 1994; Alobo, 2003]. They are sometimes used for medicinal purposes and for weight gain in malnourished babies [Alobo, 2003]. In this study, we investigated the proximate and phytochemical composition of *Pleurotus tuberregium* (Fr) sclerotia, in order to provide nutritionists with data for easy assessment of its nutritional contribution.

MATERIALS AND METHODS

Collection of Plant Samples: Samples of fresh *Pleurotus tuberregium* sclerotia were bought from Mile 3 Market, Port Harcourt, Nigeria. After due identification at the University of Port Harcourt Herbarium, Port Harcourt, Nigeria, they were cleaned of dirt and stored for subsequent use in the analysis.

Determination of Proximate Composition: A portion was used immediately for proximate analysis, in order to determine the moisture, crude protein, fat, ash, fiber, and total carbohydrate contents, all of which were carried out in triplicates according to standard methods [AOAC, 2006]. The energy value was calculated using the Atwater factors 4, 9, and 4 for protein, fat, and carbohydrate, respectively

[FAO/WHO/UNU, 1991; Chaney, 2006].

Determination of the Phytochemical

Composition: The phytochemical screening of the sample was carried out as described by Sofowora [1980] and Harbone [1973]. The sample was screened for alkaloids, flavonoids (aurones, chalcones, flavones, flavonols and leucoanthocyanins), phytates, and tannins. Quantitative determination of phytates and tannins were carried out in triplicates, using the method of AOAC [2006].

RESULTS AND DISCUSSION

Table 1 shows the proximate composition of *Pleurotus tuberregium* sclerotia. Its moisture content is greater than those reported for cowpea, groundnut, pigeon pea, soybeans (Elegbede, 1998), *Dioscorea bulbifera*, and *Dioscorea dumentorum*, comparable to that of wheat [Singh, 2004], but less than those of *Amarantus hybridus*, *Telferia occidentalis*, *Talinum triangulare* [Oguntona, 1998] and *Pennisetum purpureum* [Okaraonye and Ikewuchi, 2009]. The value observed here is lower than that earlier reported by Onyeike and Ehirim [2001] for *Pleurotus tuberregium* sclerotia. The moisture content of any food is an index of its water activity [Olutiola *et al.*, 1991], and is used as a measure of stability and the susceptibility to microbial contamination [Uraih and Izuagbe, 1990]. The implication of this is that the shelf-life of *P. tuberregium* sclerotia may be relatively longer than those of *A. hybridus*, *P. purpureum*, *T. triangulare* and *T. occidentalis* but comparable to those of cowpea, groundnut, pigeon pea, soybeans, *D. bulbifera*, *D.*

dumentorum, and wheat.

P. tuberregium sclerotium is very rich in protein. The crude protein content observed here, for *P. tuberregium* sclerotia, is higher than was earlier reported by Onyeike and Ehirim [2001] for *Pleurotus tuberregium* sclerotia, and those reported for cowpea, groundnut, pigeon pea, soybeans (Elegbede, 1998), *A. hybridus*, *T. triangulare*, *T. occidentalis* [Oguntona, 1998], *Chromolaena odorata* [Apori *et al.*, 2000], *P. purpureum* [Okaraonye and Ikewuchi, 2009], and wheat [Singh, 2004]. A 100g serving can provide about 127-141% of the recommended dietary allowance (RDA) or recommended nutrient intake (RNI) (Table 1). This high protein content implies that this plant can contribute significantly to the daily human protein requirements, usually about 23-56g [FAO/WHO/UNU, 1991; Chaney, 2006]. The crude lipid content of *P. tuberregium* sclerotia is less than was earlier reported by Onyeike and Ehirim [2001] for *Pleurotus tuberregium* sclerotia, and those of cowpea, groundnut, pigeon pea, soybeans [Elegbede, 1998] and *P. purpureum* [Okaraonye and Ikewuchi, 2009], comparable to that of wheat [Singh, 2004] and *T. occidentalis* (0.8%), but greater than those of *A. hybridus* and *T. triangulare* [Oguntona, 1998].

Its total carbohydrate content is less than was earlier reported by Onyeike and Ehirim [2001] for *Pleurotus tuberregium* sclerotia, and those of cowpea, groundnut, pigeon pea, soybeans [Elegbede, 1998], wheat [Singh, 2004], but greater than those of *A. hybridus*, *T. triangulare* [Oguntona, 1998], and *P. purpureum* [Okaraonye and Ikewuchi, 2009].

Table 1: Proximate Composition of *Pleurotus tuberregium* sclerotia.

Parameter	Composition /Wet weight Amount	% DV	Composition /Dry weight Amount	% DV
Moisture (%)	9.70		-	
Total ash (%)	2.20		2.44	
Crude protein (%)	64.31	127.43	71.21	141.11
Crude lipid (%)	0.90	1.39	1.00	1.54
Total carbohydrate (%)	20.00	6.75	22.15	7.48
Crude fiber (%)	2.89	11.43	3.20	12.65
Total metabolizable energy (kcal/100g)	345.34	17.08	382.44	18.92

Values are means of triplicate determinations. Percent Daily Values (%DV) are for adults or children aged 4 or older, and are based on a 2,000 calorie reference diet. The daily values may be higher or lower based on individual needs [NutritionData, 2008].

The Crude fiber content recorded in this study, for *P. tuberregium* sclerotia, is greater than was earlier reported by Onyeike and Ehirim [2001] for *Pleurotus tuberregium* sclerotia and those of cowpea, groundnut [Elegbede, 1998], *A. hybridus*, *T. occidentalis*, *T. triangulare* [Oguntona, 1998], and *P. purpureum*, [Okaraonye and Ikewuchi, 2009], but less than that of wheat [Singh, 2004]. A 100g serving can provide about 11-13% RDA (Table 1).

Evidence from epidemiological studies suggest that increased fiber consumption may contribute to a reduction in the incidence of certain diseases like diabetes, coronary heart disease, colon cancer, high blood pressure, obesity, and various digestive disorders [Walker, 1978; FAO, 1990; Eriyamremu and Adamson, 1994; SACN Report, 2008]. Dietary fibers alter the colonic environment in such a way as to protect against colorectal diseases. It provides protection by increasing fecal bulk, which dilutes the increased colonic bile acid concentrations that occur with a high-fat diet [Dillard and German, 2000]. So, herein rests a likely benefit derivable from the consumption of this plant.

Its ash content is less than that of cowpea, pigeon pea, and soybeans [Elegbede, 1998], *A. hybridus* and *T. occidentalis* [Oguntona, 1998], but greater

than was earlier reported by Onyeike and Ehirim [2001] for *Pleurotus tuberregium* sclerotia, and those of *T. triangulare* [Oguntona, 1998], wheat [Singh, 2004], and *P. purpureum* [Okaraonye and Ikewuchi, 2009]. The total metabolizable energy in *P. tuberregium* sclerotia is less than was earlier reported by Onyeike and Ehirim [2001] for *Pleurotus tuberregium* sclerotia, and that of soybeans, comparable to that of cowpea [Elegbede, 1998], but greater than those of *A. hybridus*, *T. triangulare* [Oguntona, 1998] and *P. purpureum* [Okaraonye and Ikewuchi, 2009].

The phytochemical screening revealed that *P. tuberregium* sclerotium is very rich in phytates and moderately rich in alkaloids, flavonoids (aurones, chalcones, flavones, flavonols and leucoanthocyanins), and tannins (Table 2). All these have potential health promoting effects, at least under some circumstances [Basu *et al.*, 2007].

Table 3 shows some of the anti-nutrients present in *P. tuberregium* sclerotia. We found low tannin content in this plant. It is lower than those reported for *C. odorata* by Apori *et al.* [2000], cowpea [Osagie, 1998] and *Trichosanthes anguina* fruits [Ojiako and Igwe, 2008].

Table 2: Phytochemical Profile of *Pleurotus tuberregium* sclerotia.

Phytochemical	Status
Alkaloids	+
Flavonoids	
• Aurone	+
• Chalcone	+
• Flavone	+
• Flavonol	+
• Leucoanthocyanin	+
Phytates	++
Tannins	+

Key: += moderately present; ++= highly present

Table 3: Some Anti-Nutritional Contents of *Pleurotus tuberregium* sclerotia.

Anti-nutrient	Composition mg/100g Wet weight	Composition mg/100g Dry weight
Phytates	2.20	2.44
Tannins	0.05	0.06

Values are Means of triplicate determination.

Tannins reduce blood cholesterol [Basu *et al.*, 2007]. The tannin content can further be reduced by processing methods like soaking, boiling, and fermentation [Esenwah and Ikenebomeh, 2008].

P. tuberregium sclerotium has low phytate content. It is lower than those reported for *P. purpureum* [Okaraonye and Ikewuchi, 2009], *Piper guineense*, *T. triangulare*, *T. occidentalis* [Oguntona, 1998], *T. anguina* fruits [Ojiako and Igwe, 2008] and *Vigna unguiculata* [Osagie, 1998]. Phytic acid binds calcium, iron, zinc and other minerals, thereby reducing their availability in the body [FAO, 1990]. It also inhibits protein digestion by forming complexes with them [Singh and Krikorian, 1982]. However, the phytate content can further be lowered by processing [FAO, 1990].

CONCLUSION

In conclusion, our results show that *Pleurotus tuberregium* (Fr) sclerotia are a rich source of proteins, fibers, and carbohydrates, and are a potential source of nutraceuticals.

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