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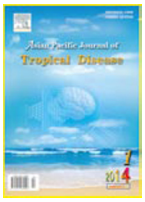

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Phytochemical screening and antioxidant activity of methanolic extract of selected wild edible Nigerian mushrooms

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PEER REVIEW

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Comments

This is a good study in which the authors phytochemically investigate as well as demonstrate the antioxidant activity of eight wild edible Nigerian mushrooms. DPPH free radical was used to evaluate the scavenging ability of the mushroom extracts and their reducing power were also assessed.
Details on Page S156

ABSTRACT

Objective: To elucidate the phytochemical content and antioxidant activity of selected wild edible Nigerian mushroom species.

Methods: Phytochemical screening was carried out using standard methods while 1,1-Diphenyl picryl hydrazyl (DPPH) radical and reductive power assays were used to evaluate the *in vitro* antioxidant properties of the selected edible Nigerian mushroom species.

Results: The result obtained revealed the presence of alkaloids, cardiac glycosides, saponins, flavonoids, terpenes, steroids, tannins and phenols in the selected mushrooms extracts. The extract of *Pleutorus ostearus* showed a significantly ($P<0.05$) higher total phenol and flavonoid content of (248.80±7.63) mg/g and (42.63±0.63) mg/g respectively compared to other mushroom extracts. *Cantherale cibarus* had the most significant ($P<0.05$) amount of alkaloids [(135.57±0.27) mg/g] and saponins [(150.41±0.50) mg/g] when compared to other extracts while the tannin content [(170.56±0.74)] mg/g was highest in the mushroom *Temitomyces robustus*. All mushroom extracts scavenged DPPH radical in a dose dependent manner. However, *Lactarus deliciousus* had the highest DPPH scavenging activity compared to the other mushroom extracts. *Pleutorus ostearus* and *Lactarus deliciousus* had better reductive power than other mushroom extracts concentrations used.

Conclusions: The mushroom species analysed have been shown to be good sources of antioxidants and other phytoconstituents, thus it can be used in the management of oxidative stress induced diseases.

KEYWORDS

Phytochemicals, Antioxidants, Mushrooms, 1,1- Diphenyl picryl hydrazyl, Reductive power

1. Introduction

Free radicals are constantly formed in the human body during energy production, in the mitochondrial electron transport chain, phagocytosis, arachidonic acid metabolism, ovulation, fertilization and in xenobiotic metabolism[1] and from external sources such as food, drugs, smoke and other pollutants in the environment[2]. Living organisms are endowed with endogenous and exogenous antioxidant defense systems capable of countering the adverse reactions of free radicals[3]. The generation of free radicals in the body beyond its antioxidant capacity actually leads to oxidative stress and this has been implicated in the etiology of a number of disorders[4]. As a result, of this much attention is being focused on the use of antioxidants to inhibit and protect damage due to free radicals and reactive oxygen species. Synthetic antioxidants such as butylated hydroxyanisole, tert-butylated hydroxyquinone and butylated hydroxytoluene are radical scavengers but are usually associated with adverse side effects[5]. Neutralization of radical damage by naturally occurring antioxidants from several sources either as food supplements or drugs is becoming one of the most acceptable modes of modern therapy[6].

Mushrooms have continued to generate a lot of interest particularly in their consumption as food[7], in the cure

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of diseases[8], in bioremediation and as important items of commerce all over the world due to their nutritional, antioxidant and therapeutic values[9,10]. They may then be utilized to be amongst the useful candidates in the search for bioactive compounds with radical scavenging activity[11,12]. Although there are many studies on nutrients compositions of different mushroom species, only few studies have been carried out on the antioxidant activity in wild edible species[12,13]. Therefore this study was carried out to elucidate the phytochemical composition and *in vitro* antioxidant activities of methanolic extract of the selected Nigerian wild edible mushrooms.

2. Materials and methods

2.1. Collection of samples

Eight indigenous wild edible Nigerian mushrooms including *Cantharelle cibarius* (*C. cibarius*), *Termitomyces robustus* (*T. robustus*), *Termitomyces manniformis* (*T. manniformis*), *Pleurotus ostreatus* (*P. ostreatus*), *Pleurotus pulmonarius* (*P. pulmonarius*), *Auricularia cularia* (*A. cularia*), *Hericium erinaceus* (*H. erinaceus*), *Lactarus deliciousus* (*L. deliciousus*) were collected from logs of wood, palm logs and humus soil from different locations in Nigeria. They were identified by a Taxonomist, Prof. Onyekwere S. C. of Applied Biology Department, Ebonyi State University Abakaliki, Nigeria.

2.2. Sample preparation and extraction

Mushrooms were destalked and air dried at room temperature with adequate ventilation and pulverized using a blender. The pulverized samples were extracted with methanol by reflux. Exactly 50 g of the powdered samples were weighed into 400 mL of methanol in a reflux flask and refluxed for 2 h. The extracts were filtered hot using a muslin cloth and subsequently evaporated using a rotary evaporator. The semi-dry extracts were weighed, placed in sterile sample bottles and stored in a refrigerator until required for use.

2.3. Qualitative phytochemical screening

The extracts were screened for phytochemical properties using standard methods[14].

2.4. Quantitative determination of the phytochemical constituents in samples

Aluminum chloride colorimetric method was used for flavonoid determination[15] while total phenol content of the extracts was determined using the method reported by Singleton *et al*[16].

The method of Oloyed[17] was used to determine the amount of alkaloids and saponins in the mushroom extracts while tannin content was quantified with the method described by AOAC[18].

2.5. In vitro antioxidant determinations

Ability of the extracts to scavenge 1,1-diphenyl-2 picrylhydrazyl (DPPH) free radical was evaluated as described by Gyamfi *et al*.[19] and the reducing power of the extracts was determined by assessing the ability of the extracts to reduce $FeCl_3$ solution as described by Oyaizu[20].

2.6. Statistical analysis

All values were expressed as mean±SEM. The SPSS program (version 16.0 SPSS Inc., Chicago, IL, USA) was used for the analysis of variance followed by the new Duncan multiple test.

3. Results

3.1. Qualitative phytochemical screening

Phytochemical sreening result revealed the presence of alkaloids, cardiac glycosides, saponins, flavonoids, terpenes, steroids, tannins and phenolics in the selected mushroom extracts in varying proportions (Table 1). Phlobatannins was absent in all mushrooms except *T. manniformis* and *P. ostreatus* while anthraquinone was present in all except *H. erinaceus*, *A. cularia* and *P. ostreatus*.

3.2. Quantitative phytochemical analysis

The quantitative phytochemical content determination of the methanolic extract of the selected mushroom result

Table 1
Phytochemical constituents of selected wild edible Nigerian mushroom species.

Mushrooms	Alkaloids	Anthraquinones	Cardiac glycosides	Flavonoids	Phenols	Phlobatannins	Saponins	Tannin	Terpenes	Steroids
C. cibarius	+ + +	+	+ +	+ +	+	−	+	+	+ + +	+ + +
T. robustus	+ +	+ + +	+ + +	+ +	+ +	−	+ +	++	+ + +	+ +
T. manniformis	+ +	+	+ + +	+ +	+ +	+	+ + +	+ +	+ + +	+ + +
P. pulmonarius	+	+ +	+ +	+ +	+ +	−	+ +	+	+ +	+ +
P. ostreatus	+ +	−	+ + +	+ +	+ +	+ +	+ +	+ +	+ +	+ +
L. deliciousus	+	+ +	+ + +	+ +	+	−	+ +	+ +	+ + +	+
A. auricula	+	−	+ + +	+	+	−	+ +	+	+ + +	+ +
H. erinaceus	+	−	+ + +	+	+	−	+	+	+	+

−: Absent, +: Faintly present, ++: Moderately present, +++: Highly present.

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