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Phytochemical and Antinutrients Evaluation of Oxyporus Populinus

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Abstract
Phytochemical and antinutrients analyses of the mushroom, Oxyporus Populinus fruiting bodies were carried out to ascertain its edibility and inedibility status and possible utilization. The phytochemical screening result showed the presence of sterols and triterpenes in large amounts: alkaloids, tannins, saponins and phlobatannins in moderate amounts; as well as carbohydrate and flavonoids in trace amounts. The antinutrients analysis revealed the presence of tannins (10.14± 0.15 mg), soluble oxalate (22.89±+ 0.02 mg),insoluble oxalate (140 ± 0.09 mg/100g), phytate (61.60±0.09 mg/100g),insoluble oxalate (79.20±0.09 mg/ 100g) and hydrogen cyanide (13.54±0.03 mg/100g) in minute quantities below the lethal doses. However, Oxyporus populinus may be inedible due to its fibrous nature and possible presence of toxins not determined in this study. There is dearth on available literature on the phytochemical, nutrients and antinutrients composition and values of Oxyporus populinus. This paper is therefore aimed at investigating the phytochemical and antinutrients parameters of Oxyporus populinus with a view of filling the information gap. The relevance of these findings are also discussed.

Keywords: mushroom, oxyporus populinus, phytochemicals, antinutrients, lethal dose

INTRODUCTION

The use of mushroom as food is probably as old as civilization and mushrooms currently have great importance in the diet of mankind (Garcha et al., 1993). Cultivation and production of mushroom are on the increase, particularly in Europe, America, Asia and Africa. Their increased nutritional importance is due to the nutritive value of high-grade mushrooms, which almost equals that of milk (Chang and Miles, 1989; Oyenuga, 1968). Mushrooms have been evaluated for their nutritional status based on the chemical composition. Cultivated and wild mushrooms contain reasonable amount of proteins, carbohydrates, minerals, fibres and vitamins (Stamets, 2000; Olei, 1996). Furthermore, mushrooms are low in calories, sodium, fats cholesterol (Chang, 1996). Certain mushrooms enjoy usage as therapeutics in folk medicines, such as traditional Chinese medicine (Peterson, 2008; Odoemena and Ekpo, 2005). The United States National Cancer Institute has chosen mushrooms as a source of new drugs for the treatment of cancer (Liu, 1993) and the ethno-medicinal value of many edible mushrooms have been reported by many researchers (*Akpaja et al., 2003*; Alofe,1999; Aletor, 1995).

Oxyporus Populinus also known as maple cork, occurs on wood substrate as parasite, in group or in vertical overlapping clusters on trunks of living deciduous trees, especially Maple, with caps ranging from 3-21cm wide (*Alexopoulos et al.,1996*). The upper surface which is white to grey in colour is covered with moss in older specimens. This perennial polypore, despite its epithet *Populinus*, is usually found near the base of living Maples, not poplars (Ji-Kai, 2006). The upper surface of *Oxyporus populinus* is apparently ideal for moss spore germination and growth. Mossy Maple cork is a major cause of stem decay of red and sugar Maple. It causes a soft, straw-colored to yellowish brown, somewhat stingy, heart rot. The fungus enters the tree through an existing stem canker, branch stub or open wound (kang and Khan, 2006). It produces irregular shaped perennial corks that are white, spongy, shelf-like and typically have a green moss growing on the upper surface. The decay column inside the stem generally extends less than one meter above and below the corks, but in the advanced stage it will completely disintegrate the heartwood leaving a hallow stem (kang and Khan, 2006; Bruns, 2006). There is dearth of information on the nutrients and antinutrients values of *Oxyporus Populinus*. The aim of this research is therefore to determine the phytochemical and antinutrients in *Oxyporus Populinus* in order to ascertain edibility and inedibility status and possible utilization.

MATERIALS AND METHODS

Oxyporus Populinus was collected from a tree in the University of Uyo town campus, Akwa Ibom State, Nigeria. The fruiting bodies were oven dried for 48 hours at 40˚C, The sample was pulverized using a manual blender and stored in a labeled air-tight container before analysis. Standard methods for phytochemical screening (for alkaloids, flavonoids, saponins, tannins, carbohydrates, phlobatannins, sterols and triterpenes), were employed: Alkaloids

determination was done using Mayer's and Dragendoff's reagents following the methods of Kapoor *et al.*,(1969) and Odebiyi and Sofowora (1978). The methods described by Kapoor *et al.*, (1969) were used for determining flavonoids. The persistent frothing test as described by Kapoor *et al.*, (1969) and Odebiyi and Sofowora (1978) was used. Five hundred milliliters of dissolved powdered sample was mixed with 10ml of distilled water, and the resulting mixture vigorously shaken and filtered. Seven drops of 10% $FeCl_3$ were added to the filtrate. A colour change to blue, black, green or blue-green was taken as an evidence of the presence of tannins and phlobatannins (Odebiyi and Sofowora ,1978). Carbohydrate determination was done using Fehling's reagent following the method described by Harbone (1991). Sterols and triterpenes were determined following the Eiebemann-Burchard test as described by Harbone (1991) and Odebiyi and Sofowora (1978).

The anti-nutritional factors of Oxyporus Populinus (phytates, tannins, hydrogen cyanide, soluble oxalates and total oxalates) were determined according to the standard methods as recommended by the Association of Official Analytical Chemists (AOAC, 1990).

RESULTS

The result of phytochemical screening of the mushroom *Oxyporus Populinus* are shown in Table 1. Sterols and triterpenes were detected in large amounts, alkaloids and saponnins were present in moderate amounts while carbohydrates, tannins and phlobatannins were present in trace amounts.

TABLE 1: Phytochemical Screening of *Oxyporus Populinus*

Phytochemical test	Observation
Alkaloids	++
Flavonoids	+
Saponins	++
Tannins	+
Phlobatannins	+
Carbohydrates	+
Sterols and triterpenes	+++

\+ - Indicates presence in trace amount
++ - Indicates presence in moderate amount
+++- Indicates presence in high amount

The anti-nutritional composition of Oxyporus Populinus showed that total oxalate content was higher (140.80±0.09 mg/100g) followed by insoluble oxalate (79.20±0.09 mg/100g), phytate (22.89±0.02 mg/100g), cyanide (13.54±0.03 mg/100g) with tannins content (10.14±0.15 mg/100g) being the least (Table 2).

Table 2: Antinutritional Composition of Oxyporus Populinus

Parameters	*Oxyporus Populinus*
Total oxalate (mg/100g)	140.80±0.09
Soluble oxalate (mg/100g)	61.60±0.09
Insoluble oxalate (mg/100g)	79.20±0.09
Tannins (mg/100g)	10.14±0.09
Phytate (mg/100g)	22.89±0.09
Cyanide (mg/100g)	13.54±0.09

DISCUSSION

The phytochemical screening of *Oxyporus Populinus* showed the presence of alkaloids, flavonoids, saponins, tannins, phlobatannis, carbohydrates, sterols and triterpenes (Table 1). According to Miles and Chang (2004), alkaloids have been isolated from hundreds of species of mushrooms and the phytochemical screening of *Oxyporus Populinus* confirmed it to be one of the mushrooms species that produced alkaloids. The presence of sterols, carbohydrates, alkaloids and saponins in many mushroom species have been reported (*Yang et al.*, 2003; *Liberra et al.*, 1995; Beecher, 2003; *Redhead et al.*, 2001). The medicinal uses of many mushrooms have also been reported (Oso, 1977). The medicinal value may be due to the presence of the secondary metabolites in these mushrooms. For example, some alkaloids in mushrooms have been found to be carcinogenic, mutagenic and teratogenic while others cause abnormal sperm and male sterility. Sterols in these mushrooms have been found to exhibit antibacterial activity (Hopple and Vilgays, 1994).

The nutritional important of a given food depends on the nutrients or anti-nutrients composition (Hotz and Gibson, 2007; Aletor and Omodara, 1994). The value for the total oxalate determined for *Oxyporus Populinus* (Table 2) was quite lower than 15-30 grams which is the reported lethal dose for oxalate hence revealing a safe margin for the *Oxyporus Populinus* analyzed.

The tannin contents value determined for *Oxyporus Populinus* (Table 2) was quite lower than the reported lethal dose which is about 6% of the animal's body weight. The values for the phytate and cyanide contents determined for *Oxyporus Populinus* (Table 2) were found to be lower than the reported lethal dose of these antinutrients. The lethal dose of phytate is reported to be from 250-500 mg/100g (Bushway *et al.*, 1998) while that of cyanide is 35mg/kg body weight (Enebong, 2001). High concentrations of anti-nutrients such as phytate, oxalate, tannins and cyanide have been known to exert substantial effects on mineral bioavailability in foods (Weaver and Kannan, 2002). Oxalate salts are poorly soluble at intestinal P^H (7.8-8) and oxalic acid is known to decrease calcium absorption in monogastric animals (Allen, 1982). These anti-nutrients form complexes with nutritionally important minerals such as Ca^{2+} ,

Mg^{2+} , Co^{2+} , Fe^{2+} , Mn^{2+} , and Zn^{2+} , thereby preventing efficient absorption by the body systems (Aletor and Omodara, 1994).

CONCLUSION

From the results of the analyses, the inedibility of *Oxyporus Populinus* is not due to the presence of antinutrients, for the antinutrients present were below their reported lethal doses. Therefore, the inedibility of *Oxyporus Populinus* could be traced to its fibrous nature and the heavy metals present or other possible implicated toxins which were not studied in the course of this work. The phytochemicals present in *Oxyporus Populinus* showed that it could find useful applications in medicine. *Oxyporus Populinus* as a mushroom is interesting to study. Future work will examine the presence of heavy metals and characterization of phytochemicals e.g Terpenes and alkaloids amongst others.

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