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SHORT COMMUNICATION

Microbial and Nutritional Qualities of Mushroom

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ABSTRACT

The microbial and nutrient quality of two species, oyster mushroom ***(Pleurotus ostreatlis)*** *and wood ear mushroom* ***(Auricularia polytrida)*** *were investigation. The bacteria isolates belong to three genera,* ***Citrobacter, Staphylococcus*** *and* ***Bacillus spp****. The fungal isolate belong to one genera,* ***Mucor spp.*** *Wood ear mushroom had more microbial load than oyster mushroom. The proximate and mineral composition of the two varieties of mushroom were also analyzed and there were no significant differences (P>0.05). calcium, magnesium, iron and zinc were appreciably high in all the two varieties while Manganese and copper were low. Carbohydrate, crude fibre and protein were also high. This makes them healthy valuable nutritional supplement for animals and human. The findings also show that the mushroom may be contaminated in the farms and market. Adequate sanitary measures and health education must be emphasized among other recommendations to safe guard the public health. The cultivation and consumption of mushroom by individual/farmers will help in solving the problems of food security.*

Key words: *bacterial isolates, fungi, proximate and mineral composition, nutritional supplement, sanitary, food security.*

INTRODUCTION

Mushroom is a special type of edible fungi forming flesh umbrella like fruiting bodies. They belong to the class of Basidiomycetes and order Agaricales. They do not posses chlorophyll, like green plants for manufacturing their food [1]. Mushrooms have now been recognized universally as food and are grown on commercial scale in many parts of the world including Nigeria. They are important features of human diet and are considered a highly nutritive food delicacy in most parts of the world. Basically because mushroomcontain qualitatively good protein (rich in lysine), vitamins (B, B, C) and minerals, they are used as food, food additives and food supplement [2-4].

One of the four categories of nutrition, which must be provided in everyday diet is protein, the body building material and is required by every cell as the basis of protoplasm. The three other nutritional categories are the source of energy - carbohydrate, accessory food factors-vitamins, and inorganic compounds which are indispensable to good health. Water is also very essential.[5]. Mushrooms contain all these categories of nutrition, which helps in solving the problems of food deficiencies. Some mushrooms have potential medicinal effect as hypo-cholesterol agent and as appetizer [6]. Mushrooms are also internationally acclaimed as poor man's meat because they are good substitute for meat which peasants cannot afford [7].

It is therefore important to examine their nutrient composition, and also study the microbial properties of these two types of mushroom-oyster and wood ear to fully appreciate the need to conserve and encourage mushroom cultivation in Nigeria. This is the significant of the study.

MATERIALS AND METHODS

COLLECTION OF SAMPLES:

Fruiting bodies of two mushroom species *Pleurotus ostreatlis* and *Auricularia polytrida* were collected from a bushy

area near Ihiagwa market in Owerri West L. G. A. Imo- State. The samples were taken to the laboratory where they were analyzed within 4 hours of collection. **Proximate analysis;** the fruiting bodies of the harvested mushrooms were oven-dried and ground. Chemical characterization of the samples via proximate analysis was carried out to determine the nutritional composition of the two mushroom species. The parameter of interest included the crude protein, fibre, fat, carbohydrate, moisture, ash, and mineral element. These parameters were determined using the methods of AOAC [8].

Microbial enumeration and isolation

The media of choice were nutrient agar, MacConkey agar and Sabouraud dextrose agar for the enumeration of total heterotrophic bacteria, lactose fermenting bacteria and fungi, respectively. The media were prepared according to the manufacturer's instruction and allowed to set in Petri plates.

Ten fold serial dilutions of the two samples were performed using 1g of sample in 9ml of 0.85% (W/V) sterile sodium chloride (NaCl) solution as diluents with vigorous agitation. A 0.1ml aliquot of the appropriate dilution was spread plated in duplicate on surfaces of the appropriate medium APHA, [9]. The plates were then incubated for between 24 and 96hrs at room temperature (30 2°C). Following incubation, the colonies were randomly selected based on their colonial characteristics and streaked for purity on nutrient agar and Sabouraud dextrose agar, respectively.

Characterization and identification of the isolates

Representative colonies of the bacterial isolates were purified, characterized and identified based on their cultural, morphological and biochemical properties as described by Cowan,[10]. Fungal isolates were examined macroscopically and then microscopically using the needle mounts technique and identified following the schemes of Alexopoulos and mims[11] and Barnett and Hunter [12].

RESULTS

Nutritional information on moisture, ash, fibre, protein, lipid and carbohydrate were analyzed as shown in table 1.

Table 1: **Proximate analysis of wood ear and oyster mushroom on nutritional quality**

Parameter (%)	wood Ear	Oyster
Protein	10.50	14.88
Lipid	6.90	8.24
Carbohydrate	14.91	11.98
Ash	6.40	6.60
Moisture	62.50	58.13
Fibre	0.80	0.61

Moisture content had the highest composition while fibre was the least considered mineral element information on both samples; iron was the highest (See Table 2).

Table 2: **Proximate analysis on mineral element**

Mineral composition (Mg/g)	Wood Ear Mushroom	Oyster Mushroom
Calcium	15.90	13.03
Magnesium	25.10	28.19
Manganese	0.62	2.30
Iron	29.70	27.85
Zinc	3.53	1.48
Copper	1.67	2.58

Values are means of three determinants.

The total bacteria count of the samples, oyster and wood ear mushroom studied were obtained after 48 hours of incubation.

The aerobic plate count of bacteria from wood ear and oyster mushroom ranged from $3.3x10^2$ to $4x10^4$ CFU/ML and $9x10^2$ to $3x10^3$ CFU/gm respectively as shown in table 3. The plate counts of viable fungi in the above samples ranged from $1.4x10^1$ to $6x10^2$ CFU/ML and $1.5x10^1$ to $6x10^3$ CFU/ML as shown in table 4.

Table 3: Viable (aerobic) bacteria isolates from wood ear and Oyster mushroom.

Samples	Dilution	Bacteria count per	Average(cfu/ML)	
Wood Ear Mushroom	10^{-2}	$3.6\ 10^{2}$	$3.0\ 10^{2}$	$3.3x10^{2}$
	10^{-3}	$2.0x10^{2}$	$1.2x10^{3}$	$1.6x10^{3}$
	10^{-4}	6×10^{4}	$2x10^{4}$	$4x10^{4}$
Oyster Mushroom	10^{2}	$1.0x10^{2}$	$8x10^{2}$	$9x10^{2}$
	10^{3}	$4x10^{3}$	$2.x10^{3}$	$3x10^{3}$
	10^{-4}	-	-	-

Table 4: Viable count of fungal isolates in Wood Ear and Oyster mushroom

Sample Per gram (CFU/ML)	Dilution of sample	Total fungal counts (CFU/ML)	Average
Wood ear Mushroom	10^{-1}	$1.8x10^{1}$ $2.0x10^{1}$	$1.4x10^{1}$
	10^{-2}	$1.0x10^{2}$ $1.2x10^{2}$	$1.1x10^{2}$
	10^{-3}	$5x10^{3}$ $7x10^{3}$	$6x10^{3}$
Oyster Mushroom	10^{-1}	$1.6x10^{1}$ $1.4x10^{1}$	$1.5x10^{1}$
	10^{-2}	$1.0x10^{2}$ $8x10^{2}$	$9x10^{2}$
	10^{-3}	$6x10^{3}$ $6x10^{3}$	$6x10^{3}$

After the characterization and identification of the isolates, three genera of bacteria were isolated, *Citrobacter sp*,*Staphylococcus aureus* and *Bacillus sp*. *Mucor sp* was also isolated.

DISCUSSION AND CONCLUSION

Mushroom is an edible fungi that is highly nutritive. The proximate properties of mushrooms reveal that they are rich plant protein sources. The protein content compares favourably with values for rice and water melon but lower than those of major plant protein sources such as cowpea and African locust bean, Ayodele *et.al.* [6] reported the presence of high concentration of lysine. This essential amino acid is generally lacking in cereals.

Statistically, it was observed that there was no significant difference in the proximate analysis of the two mushrooms at 5% level of significance $P > 0.05$. Some mushroom also form vitamin D2 [13]

Moisture content was the highest in composition while fibre was the least. An experiment carried out by Falade *et. al.*[14] observed some mushroom species in Nigeria having between 81.40% and 93.20% moisture content. The reason could be as a result of climatic condition. Miles and chang [15], also have observed high moisture content in the mushroom studied.

Mushrooms are said to be the power house of minerals including magnesium, copper, zinc, iron, calcium, etc. Serving mushroom supplies 40 - 60% of the day copper requirement. The study shows that the iron in sample 1 contains the highest composition, magnesium in sample 2 contains the highest composition as shown in table 2. The presence of Cu points to the anthropogenic input indicating the heavy metal accumulative potential of the mushrooms. However, their metal accumulating potential is dependent on the environmental attributes. Mushrooms from crude oil contaminated environment may accumulate more metals. Some medicinal mushroom cure cancer, [16].

At the required concentrations trace metals have various physiologic functions. Copper and calcium helps in hemoglobin synthesis, bone formation and transport of iron [17]. Zinc is an essential enzyme constituent while iron helps in cellular oxidation and Mg is an essential intracellular fluid cation [17]. These metals, however may become dangerous to man if they are excessively accumulated by the mushrooms because of their characteristic heat stability

and non-biodegradable nature [17-18]. As a result of these, some mushrooms are poisonous to eat [19] The microorganisms isolated from the mushrooms are of public health significance. This may be as a result of source of the samples and the season of the year [20]. Since the mushroom samples contain viable pathogenic microorganisms, the knowledge of the microbial flora is necessary for effective protection against consumption of contaminated mushrooms. Mushrooms meant for consumption should be cultured or harvested where there is no reported case of heavy metal or crude oil pollution and must be properly cooked to reduce or destroy the harmful microbial loads.

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