

MICROBIOLOGICAL ASSESSMENT OF JEW'S EAR MUSHROOM (*AURICULARIA AURICULAR-JUDAE*) SOLD IN PORT HARCOURT, RIVERS STATE.

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Abstract: Microbiological assessment of *Auricularia auricular-judae* sold in three markets in Port Harcourt metropolis was carried out. Nine microbial genera were isolated and identified on the basis of their microbiological, morphological, biochemical and physiological characteristics. The heterotrophic bacterial counts ranged between 1.8×10^4 - 4.7×10^5 Cf/g whereas the heterotrophic fungal counts ranged between 1.6×10^4 - 3×10^5 fu/g. The bacterial isolates belong to five genera, *Bacillus*, *Staphylococcus*, *Micrococcus*, *Pseudomonas* and *Serratia* species. The fungal isolates belong to four genera, *Saccharomyces*, *Aspergillus*, *Fusarium* and *Penicillium* species. The results of this study show that the microbial counts on the Jew's ear mushroom obtained from Port Harcourt metropolis were higher than the recommended 0.1×10^5 Cf/g limit of Commission on Microbiological Specification for Food (CMSF). This microbial load represents a potential health risk when the mushrooms are eaten raw or undercooked. Proper handling of the mushroom from the farm to the market and subsequently to the consumer is advised for food safety.

Keywords: Microbiological assessment, heterotrophic bacterial count, heterotrophic fungal counts, food safety.

Introduction

Mushrooms are fungi with umbrella-like fruiting bodies often generated from lignocellulosic waste materials, some of which are edible. Their nutritive qualities have made them a culinary delight in many parts of the world. Mushrooms are rich sources of fibre, proteins, vitamins and minerals such as calcium, potassium, iron, potassium and sodium (Caglarırmak, 2007; Patil *et al.*, 2010). For this reason they are used as food, food additives and food supplement. Mushrooms rank below animal meat in terms of the amount of crude protein, but well above most other foods, including milk, which is an animal product (Chang and Miles, 1989). Mushroom protein is

adjudged superior in quality to animal and vegetable protein being an intermediate of the two and it has all the essential amino acids (Kurtzman, 1976; Purkayastha and Nayak, 1981). Mushroom cultivation for medicine and consumption is on the increase and it should be encouraged in third world nations where most people cannot afford animal protein.

Auricularia auricular-judae is an edible mushroom also known as Jew's ear mushroom. The Western part of Nigeria (the Yorubas) identify it as "Olu-oliti" whereas the South-Eastern (Ibos) and South-Southern (Ikwerres) parts call it "Ero-nti" and "Erue-nsi" respectively, signifying its resemblance of the human ear. It has a soft jelly-like texture with a mild flavor and is used for mixed mushroom recipes (Conte *et al.*, 2008). The whole fruit body can be eaten and are best consumed at their early

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Nigerian Journal of Microbiology 2015, 28: 2829-2832

Published online at www.nsmjournal.org

growth stage, after a thorough cooking, sometimes taking comparatively long time to cook (Hobbs and Christopher, 1995).

The aim of this study was to assess the microbiological quality of the Jew's ear mushroom also known as *Auricularia auricular-judae*, an edible mushroom sold in major markets in Port Harcourt metropolis, as an index to the dangers that may arise from their consumption.

Materials and Methods

Sample collection

Samples were purchased from Mile I, Mile II and Mile III and Choba markets, which are major markets in Port Harcourt metropolis, Rivers State, Nigeria. The samples were collected using sterile zip polyethylene bags and transported to the Microbiology laboratory of the University of Port Harcourt for analysis.

Microbiological analysis of sample determination of microbial load

The microbial loads of the mushroom were determined using the spread plate method. 10g of mushroom sample was placed in sterile conical flask containing 90ml normal saline and agitated for a few seconds after pounding with sterile mortar. 1ml of the resultant mixture was aseptically transferred to test tube containing 9mls of normal saline medium. The dilution was continued serially until the 10⁻⁶ dilution was attained. An aliquot (0.1 ml) of the dilutions was inoculated into a sterile Potato Dextrose Agar (PDA) plates, incubated for 2 to 5 days at room temperature whereas the Nutrient Agar (NA) plates were incubated at 37°C for 24-h. Following the methods outlined by Gundana and Fagade (1982), a spread plate technique was employed by the use of bent glass rod to spread the diluted sample evenly over the surface of the agar, in triplicates, before incubation. The number of colonies was counted using colony counter. A mean of the counts from each

plate was obtained and multiplied with the appropriate dilution factor to obtain the microbial loads as total colony forming units per gram (CFU/g) for bacteria and spore forming units (SFU/g) for fungal isolates.

Identification of bacterial isolates

Isolates were identified according to Aneja 2003 by cell and colony morphology, Gram staining, catalase test, motility test, oxidase, indole production, methyl red, Voges-proskauer, hydrogen sulphide production, starch hydrolysis and carbohydrate fermentation

Identification of fungal isolates

The fungal isolates were identified by examining both their macroscopic and microscopic characteristics. Macroscopic identification was done by visualizing surface and reverse pigments on PDA plates while microscopic characterization involved shape, color and structure of conidia, hyphae, conidiophores and conidial head. The fungal isolates were identified after staining them with lactophenol cotton blue, following the methods of Raper and Fennell (1987).

RESULTS

Microbiological quality of Jew's Ear mushrooms was accessed as shown in Tables 1 and 2. The total bacterial counts ranged from 1.8x10⁴- 4.7x10⁵ CfU/g, while the total fungal counts ranged from 1.6x10⁴- 3.0x10⁵ sfu/g. Mushrooms obtained from Choba market had the highest microbial load (Table 1). The microbial isolates belong to four fungal genera: *Aspergillus* sp., *Fusarium* sp., *Saccharomyces* sp. and *Penicillium* sp.; and five bacterial genera: *Staphylococcus* sp., *Pseudomonas* sp., *Bacillus* sp., *Micrococcus* sp. and *Serratia* sp. (Table 2). The obtained microbial isolates varied with the different sites of sample isolation.

Table 1: Total Heterotrophic Bacterial and Fungal Counts

Sample designation	Bacterial counts (cfu/g)	Fungal counts (sfu/g)
M3M	1.8 x 10 ⁴	1.6x10 ⁴
M1M	1.1x10 ⁵	9.2x10 ⁴
CBM	4.7x10 ⁵	3.0x10 ⁵

M3M = Mile 3 market, M1M = Mile 1 market, CBM = Choba market

Table 2: Bacteria and Fungi isolated from Jew's Ear Mushrooms Sold in Port Harcourt

Sample designation	Bacterial isolates	Fungal isolates
M3M	<i>Staphylococcus</i> sp; <i>Pseudomonas</i> sp; <i>Bacillus</i> sp	<i>Aspergillus</i> sp; <i>Fusarium</i> sp
M1M	<i>Micrococcus</i> sp	<i>Saccharomyces</i> sp
CBM	<i>Serratia</i> sp	<i>Penicillium</i> sp

M3M = Mile 3 market, M1M = Mile 1 market, CBM = Choba market

Discussion

Results of microbiological assessment of Jew's Ear mushroom revealed a high number of microbial species. The presence of microorganisms could be as a result of source of the samples. Okechukwu et al. (2011) corroborated this claim in their findings. The total heterotrophic bacterial and fungal counts of mushrooms from Mile 1 and Choba markets were higher than the 1x10⁵ CfU/g recommended by the Commission of Microbiological Specification of Food (CMSF, 1974). The mere presence of microorganisms in food does not portend danger except if they are pathogenic and their numbers large enough to initiate an infection.

Most food spoilage microorganisms are harmless saprophytes. In this study, we found that most of the isolates can be destroyed by heat and as such would not be a problem if the mushrooms are properly cooked before consumption. The presence of *Staphylococcus* sp in some of the samples is an indication of possible contamination from human source since it can be transmitted from person to product through contact. *Staphylococcus* sp can cause food poisoning (Franzier and Thoff, 1978). *Micrococcus* and *Bacillus* are non soil genera and could find their way to the mushroom during harvesting, transporting or retailing of the product.

Stanley et al. (2008) isolated *Micrococcus* sp and *Bacillus* sp from oyster mushroom grown on organic waste and suggested that the presence of *Micrococcus* sp and *Bacillus* sp could be a reflection of the environment under which they were cultivated. The *Bacillus* sp can form heat resistant spores that can survive above boiling point.

Pseudomonas sp are known members of the microflora of mushrooms. *Pseudomonas* sp can cause a mottled, brown discoloration of mushroom under low humidity. *Aspergillus* spores are prevalent in the atmosphere, settling on suitable surfaces for growth. Mushrooms carbohydrate can serve as substrate for microbial growth. *Saccharomyces* sp play an important role in fermentation of compost and mushrooms grow on compost.

Conclusion

The results of this study have established that mushrooms sold in markets in Port Harcourt contain pathogenic microorganisms. The habit of eating uncooked mushroom as medicine should be discouraged. Mushrooms meant for consumption must be properly washed with salt and cooked to reduce or destroy the microbial load.

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