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ETHNOMYCOLOGICAL SURVEY OF MUSHROOMS USED FOR FOOD AND MEDICINE IN KOGI CENTRAL SENATORIAL DISTRICT, KOGI STATE, NIGERIA

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ABSTRACT
Mushrooms have only been traditionally used as food and medicine in Kogi Central Senatorial District, Kogi State, Nigeria with little or no scientific information about them. For this reason, it became imperative that a research on the edible and medicinal uses be carried out. The study involves ethnomycological survey of the edible and medicinal mushrooms and these include the collection of data from informants and the collection of mushrooms used as food and medicine in Kogi Central Senatorial District, Kogi State. The survey was conducted in the twenty (20) focal sites followed by the identification, preparation of specimen sample of each species of mushroom and eventual compilation of data and statistical analysis. The targeted informants included traditional medicine practitioners (TMPs), herbalists, herb sellers and other people with reputable knowledge on traditional uses of mushrooms as food and medicine. Some selected samples of at least thirteen (13) interviews were administered in each Local Government Area of Kogi Central Senatorial District (13 x 5 LGAs) making a total of sixty five (65). The data acquired from the survey were compiled and analyzed statistically using the following quantitative methods; Use Value and Fidelity Level. Male accounted for 43.08% while female accounted for 56.92% of the 65 respondents that participated in the survey. Majority of the respondents were elderly people of 51-60 (40.00%) age bracket. Other persons made up to 60.00%. Of the eleven mushroom species obtained from the ethnomycological survey, the percentage composition of edible species is 63% while the non-edible species is 37%. *Pleurotus tuber-regium* has the highest fidelity level (76.57%) while *Chlorophyllum molybdites* has the lowest fidelity level (25.00%).

Keywords*: Ethnomycological, Survey, Mushroom, Food, Medicine*

1.0 INTRODUCTION

The use of mushrooms as food and or medicine in Kogi Central Senatorial District, Kogi State, Nigeria is as old as the community. However, there is little or no scientific information on them. It therefore became necessary that a research on the edible and medicinal uses of mushrooms in this region be carried out. The study involved ethnomycological survey of the edible and medicinal mushrooms and these included the collection of data from respondents and the collection of mushrooms used as food and medicine in the focal areas.

Mushrooms are macroscopic fungi with distinctive fruiting bodies of various colours which may be either edible or non edible. Unlike plants, mushrooms are non-chlorophylous and as such are non autotrophic in nutrition. They are known to be among the largest of fungi that attracted the naturalists before the invention of microscopes. Mushrooms are fleshy spore-bearing fruiting bodies normally produced above ground, on rotten wood, on any plant material, on soil or on its food source called the substrate (of organic origin).

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They are saprophytes and include members of the Basidiomycota and some members of the Ascomycota. They consist of two main parts, called the mycelium and the fruiting body (sporocarp). The mycelium consists of a tree-like structure called hyphae. The mycelium absorbs food nutrients while the hyphae form into mycelia which forms the fruit structure on the surface when atmospheric conditions particularly humidity is favorable. The spore producing tissue (ascus or basidium) is called the hymenium (Etang *et al.,* 2006).

Mushrooms vary in sizes, color, texture and structure that favour their spore formation. The cap is called the cuticle and varies among different mushroom species, being sticky or slimy in texture. The stalk is the stem-like structure on which the cap is mounted and this varies in length depending on the species (Gyar and Ogbonna, 2006).

Wild edible mushrooms are popular in some rural communities and their appearance during the planting season when food is scarce in these areas is seen by the local dwellers as nature's food providence (Odebode, 2005). Mushrooms have assumed greater importance in the diets of both rural and urban dwellers, unlike previously when consumption was confined to rural dwellers. Mushrooms are now marketed along highways and urban centres (Aremu, *et al.* 2008). Most of the mushrooms consumed in Nigeria are picked by rural dwellers from farmlands, forests and around waste dump sites when environmental conditions particularly high humidity is suitable for the formation of sporocarp. Africa is abundantly blessed with edible species of mushroom and many people in African countries still depend on collection of wild edible mushrooms for food (Peter, 1991).

Mushrooms require moderate rainfall and pH range of 3-10 for proper growth and are commonly found in areas with temperature range of 2^{o}C (Ezeibekwe *et al*., 2009). In a survey conducted by Eze *et al* (2014), it was reported that the mushroom species grew in cultivated or fallow farmlands, termite hills, tree trunks, decaying bunches of male and female inflorescence of oil palm trees, and decaying wood logs during the rainy seasons (between May and October) when humidity is very high. But in the course of the study, mushrooms such as *Pleurotus. tuber-regium* and *Lentinus. squarrosulus* were found on their hosts (usually decaying tree trunks) throughout the year with the most frequently occurring mushrooms in the study found to be *Termitomyces mammiformis* and *Pleurotus. tuber-regium* in this order while the least in occurrence was *Tuberia sp*.

The traditional searching or hunting for mushrooms from the wild particularly during the growing season is a common practice in Nigeria and especially in Kogi Central region, Kogi State. The harvest is either prepared into food or special delicacy or used for medicinal purpose or even sold for generating income or retailed in local markets to augment family income (Osemwegie *et al.,* 2010). The protein content of mushrooms has been reported to be twice that of vegetables and four times that of oranges (Bano, 1993), significantly higher than that of wheat (Aletor, 1993) and of high nutritional quality comparing favourably with meat, egg and milk (Thatoi and Singdevsachan, 2014).

Among all species of mushroom, the oyster mushroom is the second widely cultivated mushroom worldwide following the *Agaricus bisporus* (Kues and Liu, 2004). *Pleurotus* species are popular and widely cultivated throughout the world mostly in Asia, America and

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Europe because of their simple, low cost production technology and high biological efficiency (Mane *et al.,* 2007). *Pleurotus* species are efficient lignin degraders which can grow on a wide variety of agricultural wastes and grown at a wide range of temperatures. They have high economical, ecological, and medicinal values. Moreover, they are able to colonize and degrade a large variety of lignocellulosic materials and other wastes which are produced in agricultural, forest and food-processing industries (Sanchez, 2010).

In general, mushrooms contain 90% of water and 10% of dry mater. Their nutritional value can be compared to that of eggs, milk and meat (Oei, 2003). They are a good source of carbohydrates, proteins, vitamins and minerals (Ananbeh, 2003). They grow on decayed organic matter rich in lignin, cellulose and other complex carbohydrates.

A number of factors usually influence the nutritional composition of mushroom. These factors include growing site, type of substrate, mushroom type, developmental stages and part of the fungal samples analyzed (Adetolu, 2003).

There is poor documentation of ethno knowledge on edible and medicinal mushrooms among Nigerians and in particular people of Kogi Central region of Kogi State, which serves as prelude to loss in vital information on a daily basis. The region is a typical guinea savanna flanked at various points with mountains and hills. Majority of people are farmers and civil servants. The area normally experiences an average annual rainfall of six to seven months (April to October) and annual dry season of five to six months (October to March). Despite the nutritional and medicinal value of mushrooms, searching and documenting the indigenous knowledge about them as well as their uses in food and medicine had not been given the desired attention within the study sites.

Human activities such as dumping of refuses of plant origin, cassava peels, coco nut fibre, maize cobs, rice straw, bean straw, sugar cane bagasse, saw dust, cutting down of trees which later decayed etc must have been responsible for occurrence, growth and proliferation of mushrooms in this region surveyed. According to Viziteu, (2000), the growth of oyster mushrooms requires high humidity (80 – 90%) and high temperature (18 – 30^{o}C), lower temperature of (18 – 25^{o}C) and pH (5.5 – 6.5) for vegetative growth. Similarly, these factors are obtainable in the Central Senatorial District, Kogi State, Nigeria to support the growth of oyster mushrooms and other species in the region.

The objective of this study is to conduct survey, identify and authenticate wild mushrooms of nutritional and medicinal importance that grow naturally or artificially in different areas and at different seasons across the study sites.

2.0 MATERIALS AND METHODS

2.1 Study Design

This research was specifically conducted in two broad perspectives. The first perspective is the ethnomycological survey of edible and medicinal mushrooms and these include the collection of data from informants and the collection of mushrooms used as medicine in Kogi Central Senatorial District, Kogi State (a guinea savanna and mountainous region). This is followed by preparation of specimen samples of each species of mushroom, identification and eventual compilation of data and statistical analysis.

During the survey, visits were made to traditional medical practitioners, herbalists, herb sellers and individuals knowledgeable in the use of mushrooms as food and medicine using a scientifically semi-structured

questionnaire. The interview was conducted in local languages of the respective study site with the questionnaire as a guide, using a tape recorder and/ or camera where applicable. Interpreters were as well employed where necessary in order to ease communication.

2.2 Study Sites

The survey cut across five Local Government Areas; Adavi LGA (Zango Daji, Osara, Kuroko, Inoziomi, Ogaminana, Nagazi), Okene LGA (Okene, Checkpoint, Obehira, Okenwue), Okehi LGA (Eika, Obangede, Okaito, Ihima), Ajaokuta LGA (Adu, Eganyi, Adogo, Ajaokuta), Ogori Mangogo LGA and their associated farm centres as well as sawmills.

2.3 Survey of Mushrooms and Identification

The survey with ultimate objective of identifying, authenticating and documenting the medicinal and nutritional mushrooms used in Kogi Central region of Kogi State, Nigeria was conducted between April and November, 2017 in the twenty (20) focal sites. Both male and female were interacted with during the survey. The targeted class of people included traditional medicine practitioners (TMPs), herbalists, herb sellers and other people with reputable knowledge on traditional uses of mushrooms as food and medicine. Some selected samples of at least thirteen (13) interviews were administered in each local government area of the entire study site making a total of sixty five (65). However, only a few women could be interviewed as some were not readily available because of their household engagements and marital restriction. To put record straight, interactions were made possible to some women only after taking permission from their husbands based on their culture.

2.4 Procedures for Data Collection

On carrying out the survey, a scientifically semi-structured questionnaire for collection of relevant data was designed and used as a supplementary tool. A tape recorder and a camera were employed during the interaction with respondents to record their information. Enquiries were made as to what mushroom was edible and what mushroom was used as medicine in managing ailment of any kind as this approach usually ensure the selection and collection of workable data as described by Lampman (2004) and Adhikari *et al*. (2005). Key potential informants were selected randomly and systematically based on recommendations of knowledgeable elders. Data collection was made possible using the communicable dialects within the focal areas in line with standard inquiry procedure and with the aid of research instruments on the basis of the rule designed by Ayodele (2011).

Photographs of collected edible and medicinal mushrooms were taken in order to facilitate their identification. Identification was made at the African Centre for Mushroom Research and Technology Innovations, Department of Plant Biology and Biotechnology, University of Benin, Benin City, Nigeria.

2.5 Statistical Analysis

2.5.1 Bio-demography of the Respondents

The data generated was analyzed with the aid of descriptive statistics such as frequency and percentage for comparing the social status of the respondents across the study sites of the survey.

2.5.2 Data Analysis of the mushrooms Collected

The data acquired from the survey were compiled and analyzed statistically using the following quantitative methods {Use Value (UV) = $\sum u/n$} and Fidelity Level {FL = $Np/N \times 100\%$} as

described by Friedman *et al*. (1986) and Philips (2002) respectively. U = total number of uses where n = number of respondents that cited a particular species. Ip = number of respondents who cited the species for a particular use where Iu = total number of respondents that cited the plant for any use. The higher the number of citation made about a species the higher the Use Value.

3.0 RESULT AND DISCUSSION

3.1 Bio-demography of Respondents who participated in the ethnomycological survey of Mushrooms used for Food and Medicine in Kogi Central Senatorial District of Kogi State, Nigeria

By the ethnomycological survey results in Table 1, male accounts for 43.08% while female accounts for 56.92% of the 65 respondents which shows that females have better knowledge on mushrooms than males. Majority of the respondents are elderly people of 51-60 (40.00%) age bracket. This may make knowledge of mushrooms and their uses vulnerable to loss if it is not documented for record purpose because more people in this age bracket are much more liable to pass away than the other age brackets over time. Other persons made up to 47.69% of the 65 respondents indicating a common awareness of mushrooms among the diverse people of the area. 43.77% of the respondents claimed to have got the knowledge through inheritance from parents and this shows the transfer of ethnomycological knowledge from generation to generation. This observation is similar to that observed by Amujoyegba *et al*. (2016).

Demographic Features	Frequency	%Percentage
Gender		
Male	28	43.08
Female	37	56.92
Total	65	100
Age		
21-30	4	6.15
31-40	13	20.00
41-50	17	26.15
51-60	26	40.00
61-70	2	3.08
Unknown	03	4.62
Level of Education		
Illiterate	23	35.38
Primary	27	41.54
Secondary	11	16.92
Tertiary	4	6.15
Occupation		
Traditional Healers	8	12.31
Herb Sellers	26	40.00
Others	31	47.69
Source of Knowledge		
Inheritance	28	43.77
Apprenticeship	19	29.23
Others	18	27.69

3.2 List of Edible, Non-edible and Medicinal Mushrooms used in Kogi Central Senatorial District, Kogi State, Nigeria

The survey shows that mushroom (edible and non edible) of medicinal importance are found in the region (Table 2). In effecting treatment, the mushrooms are administered orally either

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as recipe in food or taken alone according to the respondents. It may be amazing that some non edible mushrooms are also used in the treatment of some ailments. This is because any material could be poisonous or safe depending on the dose taken. This is in accordance with the opinion credited to the famous Renaissance physician Paracelsus (1493 - 1541) often referred to as the "Father of Toxicology" who said "all things are poison. Solely the dose determines that a thing is poison or not poison".

The relative significance of the mushroom species as reported from the ethnomycologicaal survey with their fidelity level highlighted in Table 2. The **Fidelity Level** was evaluated using Philips and Gentry statistical tool. *Pleurotus tuber-regium*, **Pleurotaceae** has the highest fidelity level (76.57%) while *Chlorophyllum molybdites,* Agaricaceae has the lowest fidelity level (25.00%) respectively (Table 2) on the basis of being used as either food or medicine by the people of the region under study.

The eleven mushrooms collected among some of which are either edible or non-edible were claimed to be used in managing/treating various ailments and others are for eating as enlisted in Table 2 are arranged in alphabetical order of scientific name with their botanical name, common name, local name. *Pleurotus tuber-regium*, Pleurotaceae has the highest frequency of citation indicating it is the most commonly used mushroom. This is shown by its Fidelity level (76.62%).

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Table 2: List of Edible, Non edible and Medicinal Mushrooms used in Kogi Central Region, Kogi State, Nigeria

S/No	Scientific Name	Family Name	Common Name	Local Name	Edibility	Medicinal uses	Use Value	Fidelity Level
1	*Agaricus arvensis*	Agaricaceae	horse mushroom	Okenvi tuepe (Ebira)	edible	Antidiabetic, antiarteriosclerosis	0.67	33.33
2	*Cantharellus cibarius*	Cantharellaceae	Cantharelle	Uruechi (Ebira)	Edible	Antiinflammatory	0.70	40.00
3	*Chlorophyllum molybdites*	Agaricaeae	False parasol	Akamu (Ebira)	Non edible	antidiarrhea	0.63	25.00
4	*Coprinus atrameltarius*	Psanthyrellaceae	Ink cap	Uruochahuogodo (Ebira)	Edible	antidiabetic	0.78	63.00
5	*Daedalea quercina*	Fomitopsidaceae	Oak mazegill	Ipenyi (ogori)	Non edible	Bee anaesthetization	0.80	60.00
6	Galerina autumnalis	Hymenogastraceae	Deadly galerina	urubede (Ebira)	Non edible	Anti-diabetic	0.83	66.67
7	*Lepiota procera*	Agaricaceae	Parasol	urubede (Ebira)	edible	unknown	0.75	50.00
8	*Termitomyces sp*	Lyophyllaceae	-	Oknvo (Ebira)	Edible	unknown	0.86	75.00
9	*Pleurotus ostreatus* (Jacq. ex Fr) P.Kumm	Pleurotaceae	Oyster mushroom	Uruodinvaku (Ebira)	Edible	Antimicrobial, lowers blood pressure	0.75	50.00
10	*Pleurotus tuber-regium* (Rumph. ex Fr) Singer	Pleurotaceae	King-tuber mushroom	Ogogo (Ebira)	Edible	Anti-diabetic	0.88	76.57
11	*Trametes cervina* (Schwein.) Bres.	Polyporaceae	-		Non edible	Cough remedy	0.83	66.67

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3.3 Percentage Distribution of Edible and Non-edible Mushroom Families used in Kogi Central region of Kogi State, Nigeria

Figure: Percentage distribution of edible mushroom and non edible mushroom species as collected from the survey in Kogi Central Region of Kogi State.

3.4 Ethnomycology of Edible and Medicinal Mushrooms

The Ethnomycological survey carried out in various communities in Kogi Central Region of Kogi State, which include Adavi LGA (Zango Daji, Osara, Kuroko, Inoziomi, Ogaminana, Nagazi), Okene LGA (Okene, Checkpoint, Obehira, Okenwue), Okehi LGA (Eika, Obangede, Okaito, Ihima), Ajaokuta LGA (Adu, Eganyi, Adogo, Ajaokuta), Ogori Mangogo LGA and their associated farm centres as well as sawmills shows that there are considerable varieties of mushroom species across these study sites.

During the ethnomycological survey, it was noted that some informants reluctantly divulged information about the mushroom species which they use in treating diseases, for fear of losing patronage and consequently income, and some claim that revealing intellectual property is against their ancestral will as already pledged.

Of the eleven mushroom species obtained from the ethnomycological survey, the percentage composition of edible species is 63% while the non-edible species accounted for 37% (Fig.). Perhaps due to poor knowledge of preservation of mushrooms and their destruction in the wild during agricultural, industrial or building activities pose threat to the sustainability of mushrooms of nutritional and medicinal importance. The users usually exploit these mushrooms indiscriminately with little or no consideration for regeneration and this practice may result in the extinction of some of the mushroom species in the areas in the nearest future.

Conclusion:

As the result analysis indicated, majority of the participants of this survey are elderly and for this reason, the society apparently stands the risk of losing the ethnomycological knowledge by passage of generation. This study provides some vital information about the edible and medicinal mushrooms collected to be kept as a model checklist for future use as reference. This study also serves as lead to ethnomycological and diversity knowledge on mushroom species in the researched area.

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