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Nutritional and Anti Nutritional Characteristics of Some Dominant Fungi Species in South Western Nigeria.

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--ABSTRACT--
This study was carried out in three forest reserves of the southwest, Nigeria (Akure forest reserve, Omo forest reserve, Eda forest reserve), examining the nutritional and anti-nutritional characteristics of six dominant fungi species (i. e. Trametes vesicolor, Pleurotus sajor cajor, Xylaria polymorpha, Xylaria hypoxylon, Auricularia-auricularia judae and Coltricia perennis). The proximate analysis, the crude fibre, the crude protein, the fat content and the ash content were determined. For the anti-nutrient composition, oxalate, phytate, tannin and the flavonoid content were also determined. The mushroom contained 0.855-0.225mg/g of oxalate, 11.535-3.705mg/g of phytate, 0.116-0.035mg/g of tannin, 4.795-0.925mg/g of flavonoid. The mushroom species also contained 7.645-0.610 of the ash content, 17.500-3.720 of crude protein, 36.805-2.490 of crude fibre and 5.875-0.345 of the fat content. The mushroom species contained 0.235-0.29 of calcium, 0.264-0.515 of magnesium and 45.81-137.72 of phosphorus.

KEY WORDS: *Nutrition, anti nutrients, minerals, dominant, mushrooms.*

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I. INTRODUCTION

Fungi are diverse and numerous with more than a million species of fungi known. Fungi are unicellular or multi cellular organisms (plant like) with thread like hyphae but with the absence of chlorophyll which plants use in the production of food for themselves. With the absence of this (i.e. chlorophyll), they don't produce chlorophyll food, they get their food from absorption of nutrients from others therefore, Nutrition in fungi is heterotrophic and absorptive. They secrete enzymes that break down organic matters and then absorb soluble products (Chang, 1991) Fruiting bodies of fungi (mushroom) are very important food components in major parts of Nigeria, Africa and even the world in entirety. Apart from food component, in Nigeria, mushrooms also serve as medicinal purposes (Alofe *et al*, 1998). During the rainy season, different species of both edible and non edible species usually grow and various factors usually influence the nutritional natural substrates such as garden soil, decaying wood, leaf litters, under the shade provided by trees. Mushrooms grown in the forest have been found to be more nutritious and important for medicinal purposes (Manzi et al, 1999). Mushrooms are rich in nutrients containing necessary and important materials like protein, sugars, glycogen, lipids, vitamins, amino acids fibers, and every necessary nutrient important for the proper functioning of the body.

Several conditions affects the nutritional composition of these mushrooms such as the growing site, the type of substrate, the mushroom type, developmental stages and part of the fungal samples analyzed. Apart from these nutritional value of some mushrooms, there are a lot of mushroom that are not edible due to the presence of some anti nutritional factors that are detrimental to normal health functioning. Anti-nutritional factors are those substances generated in natural feed stuffs by the normal metabolism of species and by different mechanism (e.g. inactivation of some nutrients, diminution of digestive process or metabolic utilization of feed) which causes effects contrary to optimum nutrition (Okolie and Gbuji, 2002). On most cases, these anti-nutrients are commonly synthesized by plants to serve as a protective measure for them. It serves as protection against attack by herbivores, insects and so on and also as a means to survive harsh growing conditions. If such plants are consumed, it leads to adverse health problems. Some of the anti nutrients to be considered in this research are tannin, flavonoid, oxalate and phytate.

II. MATERIALS AND METHODS

This study was carried out at the rainforest vegetation zone of Ondo state (Akure forest reserve), Ekiti state (Eda forest reserve), Ogun state (Omo forest reserve).

Ogun State is a state in South-western Nigeria which borders Lagos State to the South, Oyo and Osun states to the North, Ondo State to the east and the republic of Benin to the west. The state lies between latitude 7°00'N and longitude 3°35'E. Ekiti State is mainly an upland zone, rising over 250 meters above sea level. It lies on an area underlain by metamorphic rock. It is generally undulating country with a characteristic landscape that consists of old plains broken by step-sided out-crops that may occur singularly or in groups or ridges, the state is also dotted with rugged hills. It lies between latitude 7°40'N and longitude 5°15'E. Ondo state is located in the southwestern zone of Nigeria. The state is made up of 18 Local Government Areas, and is bounded in the north by Ekiti and Kogi States, in the east by Edo State, in the west by Osun and Ogun states and in the south by the Atlantic Ocean. Ondo State is located entirely within the tropics. It is located between latitude 7°15'0''N and longitude 5°11'42''E.

Laying of plots: In each of the forest, one hectare (100 × 100 m) was mapped out and sub-divided into plots of 25 m × 25 m. Five plots were randomly selected using the simple random sampling and on each plots, every fungi seen was handpicked, stored and five of the dominant ones were brought to the laboratory for necessary analysis.

Proximate analysis: This was determined by examine moisture content, crude protein, fat, ash content and crude fibre according to the standard methods (AOAC, 2000). The protein content was obtained by multiplying the nitrogen content by 6.25 and the carbohydrate content was obtained by difference. Calorific values was obtained by multiplying the values of the crude protein, fat, and carbohydrate contents (except crude fibre) by their physiological fuel values of 4, 9, and 4 kcal/100 g respectively taking the sum of the products.

Mineral analysis: Tannin: Gravimetric determination of tannin was done to determine the tannin of the sample. 0.2 g of the defatted samples was weighed into test tubes and tannin was extracted in 10 ml 70% acetone. It was then placed in iced water bath for 10 minute to allow for complete extraction of tannin. 0.2 ml of the filtrate were placed in test tubes and made up to 1ml with distill water. 2.5 ml of 20% Na_2CO_3 and 0.3 ml folin's reagent diluted with distilled water were added and the content was mixed properly. The solution was incubated for 45min at room temperature to develop color (blue color).
1ml standard tannic acid solution ranging from 0.01-0.05 mg/ml was also prepared, followed by the addition of 2.5 ml Na_2CO_3 and 0.5 ml folin's reagent. The absorbent of each samples were read at wave length 700 mm using a corning colorimeter 253, corning Ltd, Essex, England, against a reagent blank. The tannin content in each sample was deduced from the standard tannin curve.

Phytate: For phytate determination, 4 g of the samples were soaked in 100 ml of 2% HCL for 3 hours and then filtered. 25 ml of the filtrate was placed in a conical flask. 5 ml of 0.3% ammonium thiocyanate solution was added as indicator and 53.3 ml of distilled water was added to give it proper acidity. This was titrated with standard Fe_2O solution until a brownish yellow color persists for 5 minutes.

Oxalate: The determination was done according to Day and Underwood (1986). 1 g of the samples were put into a separate plastic bottles followed by the addition of 75 ml of 1.5N H_2SO_4. The content was mixed properly and allowed to extract for 1 hour with constant agitation using a mechanical shaker. This was then filtered and 25 ml of the filtrate was titrated with 0.1 ml $KMnO_4$ while hot (80-90°C) until a purple color is observed at end point. The titre value was then multiplied by 0.9004 to give the result expressed as mg/g.
Oxalate mg/g = Titre value × 0.9004

Flavonoid: Three methods were used to determine the presence of flavonoid in the sample. 5 ml of dilute ammonia solution were added to a portion of the aqueous filtrate of each sample extract followed by addition of concentration H_2SO_4. A yellow coloration observed in each extract indicated the presence of flavonoids. The yellow coloration disappears on standing.
Few drops of 1% aluminum solution were added to a portion of each filtrate. A yellow coloration was observed indicating the presence of flavonoids. A portion of the sample was in each case heated with 10 ml of ethyl acetate over a steam bath for 3 min. The mixture was filtered and 4 ml of the filtrate was shaken with 1 ml of dilute ammonia solution. A yellow coloration was observed indicating a positive test for flavonoids.

Method of data analysis: Data from this research was analyzed with the use of the Statistical Package for Social Scientist (SPSS) and the acquired data was subjected to the Analysis of Variance (ANOVA). Means separation was done by Duncan Multiple Range Test (Duncan 1955).

III. RESULTS:

The result from table 1 shows that the proximate analysis is statically significant (P ≤ 0.05) (Ash content, crude protein, crude fibre, fat) of the six mushroom species. Table 1: ANOVA table showing the proximate composition of six dominant mushroom species obtained from the forest reserves.

Proximate content	Source of variation	Sum of squares	df	Mean square	F-value	sig
Ash content	Treatment	65.273	5	13.055	151.197	0
	Error	0.518	6	0.086		
	Total	65.791	11			
Crude protein	Treatment	221.019	5	44.204	962.173	0
	Error	0.276	6	0.046		
	Total	221.295	11			
Crude fibre	Treatment	1522.634	5	304.527	2146.570	0
	Error	0.851	6	0.142		
	Total	1523.485				
True fat	Treatment	33.043	5	6.609	160.466	0
	Error	0.247	6	0.041		
	Total.	33.290	11			

The ANOVA result for the Antinutrient composition in table 2 implies that there is also a significant (P ≤ 0.05) difference in the Antinutrient composition (tannin, phytate, flavonoid, and oxalate) of the six dominant mushroom species.

Table 2: ANOVA table for the anti-nutrient composition of six dominant mushroom species in the forest reserves.

Antinutrient content	Source of variation	Sum of squares	Df	Mean square	F-value	Sig
Oxalate	Treatment	0.527	5	0.10	19.4954	0
	Error	0.032	6	0.005		
	Total	0.559	11			
Phytate	Treatment	102.322	5	20.464	51.454	0
	Error	2.386	6	0.398		
	Total	104.708	6	0.002		
Tannin	Treatment	0.009	6	1.15E-007	16480.777	0
	Error	6.90E-007	11			
	Total	0.009				
Flavonoids	Treatment	19.982	5	3.996	167.274	0
	Error	0.143	6	0.024		
	Total.	20.126	11			

The mean value and the standard error for the anti-nutrients are presented in table 3. The oxalate content ranges from 0.855 to 0.225 with *Pleurotus sajor cajor* recording the highest value while *Auricularia judae* recorded the least value.The Phytate content ranges from 11.535 mg/g to 3.705 mg/g with *Pleurotus sajor cajor* having the highest and *Auricularia judae* having the least. Tannin content ranges from 0.116 to 0.035 with Trametes vesicolor having the highest and *Xylaria hypoxylon* having the least. Flavonoid ranges from 4.795 to 0.925 with *Pleurotus sajor cajor* having the highest and *Auricularia judae* possessing the lowest. The table shows that *Pleurotus sajor cajor* is significantly higher in oxalate content and *Xylaria hypoxylon* is significantly lower in oxalate content. However, there is no significant (P ≥ 0.05) difference between the oxalate composition of *Auricularia judae* and *Xylaria hypoxylon*, also a significant (P ≤ 0.05) difference between the oxalate composition of *Xylaria polymorpha* and *Trametes vesicolor*. There is no significant (P ≥ 0.05) difference between

Trametes vesicolor and *Coltricia perennis*, there is also no significant difference between *Coltricia perennis* and *Xylaria polymorpha*. There is a significant ($P \leq 0.05$) difference between *Xylaria hypoxylon* and *Pleurotus sajor cajor*. *Pleurotus sajor cajor is* significantly higher in phytate content while *Auricularia judae* is significantly lower in phytate content. There is however no significant ($P \geq 0.05$) difference between the phytate composition *Auricularia judae* and *Xylaria hypoxylon*, no significant ($P \geq 0.05$) difference between *Xylaria hypoxylon* and *Coltricia perennis*, no significant ($P \geq 0.05$) difference *Coltricia perennis* and *Trametes vesicolor*. There is a significant ($P \leq 0.05$) difference in the phytate content between *Trametes vesicolor* and *Xylaria polymorpha* and also *Xylaria polymorpha* and *Pleurotus sajor cajor*. Of these six species, *Pleurotus sajor cajor* also has the highest level of tannin and *Xylaria hypoxylon* having the lowest. However, there is a significant difference in the tannin content of the six mushroom species. *Pleurotus sajor cajor* is significantly ($p \leq 0.05$) higher in flavonoids content while phytate content is significantly lower in *Auricularia judae*. Table 3 show that there is no significant ($P \geq 0.05$) difference in the flavonoid composition between *Auricularia judae* and *Xylaria polymorpha*, between *Xylaria polymorpha* and *Xylaria hypoxylon*. The flavonoid content between *Trametes vesicolor* and *Xylaria hypoxylon* is significantly ($P \leq 0.05$) different. However, there is no significant ($P \geq 0.05$) difference between *Trametes vesicolor* and *Coltricia perennis*. There is a significant difference between *Coltricia perennis* and *Pleurotus sajor cajor*.

Table 3: Mean value table showing mean and S.E for the anti-nutrient analysis.

Treatment	Oxalate	Phytate	Tannin	Flavonoids
Pleurotus sajor-cajor	$0.855{\pm}0.52^{d}$	$11.535{\pm}0.446^{e}$	$0.080{\pm}0.00^{e}$	$4.795{\pm}0.109^{d}$
Auricularia judae	$0.225{\pm}0.52^{a}$	$3.705{\pm}0.446^{a}$	$0.037{\pm}0.00^{b}$	$0.925{\pm}0.109^{a}$
Xylaria hypoxylon	$0.315{\pm}0.52^{a}$	$4.120{\pm}0.446^{ab}$	$0.035{\pm}0.00^{a}$	$1.690{\pm}0.109^{b}$
Coltricia perennis	$0.540{\pm}0.52^{bc}$	$5.350{\pm}0.446^{bc}$	$0.052{\pm}0.00^{c}$	$2.770{\pm}0.109^{c}$
Xylaria polymorpha	$0.630{\pm}0.52^{c}$	$9.880{\pm}0.446^{d}$	$0.073{\pm}0.00^{d}$	$1.175{\pm}0.109^{ab}$
Trametes vesicolor	$0.405{\pm}0.52^{ab}$	$6.175{\pm}0.446^{c}$	$0.116{\pm}0.00^{f}$	$2.430{\pm}0.109^{c}$

The mean value and the standard error for the proximate analysis are presented in table 4. Ash content ranges from 7.645 to 0.610 with *Pleurotus sajor cajor* having the highest and *Auricularia judae* having the least value. Crude fibre ranges from 36.805 to 2.490 with *Xylaria hypoxylon* recording the highest and *Auricularia judae* having the least value. The fat content ranges from 5. 85 to 0.345, *Pleurotus sajor cajor* have the highest value and *Auricularia judae* having the least.

The result of table shows that ash content is significantly ($P \leq 0.05$) higher in *Pleurotus sajor cajor* while it is significantly ($P \leq 0.05$) lower in *Auricularia judae*. However, there is no significant ($P \geq 0.05$) difference in the ash content of *Auricularia judae* and *Trametes vesicolor*, also there is no significant ($P \geq 0.05$) difference between that of *Trametes vesicolor* and *Xylaria polymorpha*, but there is a significant ($P \leq 0.05$) difference between *Xylaria polymorpha* and *Coltricia perennis*. There is no significant ($P \geq 0.05$) difference between *Coltricia perennis* and *Xylaria hypoxylon*. There is a significant ($P \leq 0.05$) difference between *Xylaria hypoxylon* and *Pleurotus sajor cajor*.

Protein content is significantly higher in *Pleurotus sajor cajor* while it is significantly lower in *Trametes vesicolor*. However there are significant ($P \leq 0.05$) differences in between all the fungi considered except *Coltricia perennis* and *Pleurotus sajor cajor*. There is no significant ($P \geq 0.05$) difference between Xylaria polymorpha and Coltricia perennis. There is also a significant ($P \leq 0.05$) difference between *Coltricia perennis* and *Pleurotus sajor cajor*.

Xylaria hypoxylon is significantly higher in crude fibre content and *Auricularia judae* is significantly lower in crude fibre. However, there is a significant ($P \leq 0.05$) difference in the crude fibre content of all the six fungi species considered.

Pleurotus sajor cajor is significantly higher in true fat content and *Auricularia judae* is significantly lower in the fat content. There is a significant ($P \leq 0.05$) difference in the fat content of all the fungi species considered except for *Trametes vesicolor* and *Coltricia perennis* that has no significant ($P \geq 0.05$) difference. There is a significant ($P \leq 0.05$) difference between *Coltricia perennis* and *Pleurotus sajor cajor*.

Table 4: Mean value table showing mean and S.E for the proximate analysis.

Treatment	Ash content	Crude protein	Crude fibre	True fat
Pleurotus sajorcajor	$7.645{\pm}0.208^{d}$	$17.500{\pm}0.152^{e}$	$11.525{\pm}0.266^{b}$	$5.875{\pm}0.143^{e}$
Auricularia judae	$0.610{\pm}0.208^{a}$	$3.720{\pm}0.152^{a}$	$2.490{\pm}0.266^{a}$	$0.345{\pm}0.143^{a}$
Xylaria hypoxylon	$3.260{\pm}0.208^{c}$	$6.445{\pm}0.152^{b}$	$36.805{\pm}0.266^{f}$	$2.455{\pm}0.143^{c}$
Coltricia perennis	$3.050{\pm}0.208^{c}$	$7.960{\pm}0.152^{d}$	$22.540{\pm}0.266^{c}$	$2.985{\pm}0.143^{d}$
Xylaria polymorpha	$1.520{\pm}0.208^{b}$	$7.770{\pm}0.152^{d}$	$29.155{\pm}0.266^{e}$	$1.865{\pm}0.143^{c}$
Trametes vesicolor	$1.220{\pm}0.208^{ab}$	$7.220{\pm}0.152^{c}$	$24.215{\pm}0.266^{d}$	$2.965{\pm}0.143^{d}$

The ANOVA result for the mineral composition in table 5 implies that there is also no significant ($P \geq 0.05$) difference in the calcium composition of the six mushroom species. There is a significant ($P \leq 0.05$) difference in the magnesium and phosphorus composition of the six mushroom species.

Table 5: ANOVA table for the mineral composition of six dominant mushroom species in the forest reserves.

Mineral content	Source of variation	Sum of squares	df	Mean square	f. value	Sig.
Calcium	Treatment	0.004	5	0.01	2.129	0.192
	Error	0.002	5	0		
	total	0.007	5			
magnesium	Treatment	0.095	6	0.019	45.970	0.000
	Error	0.002	6	0		
	total	0.098	6			
phosphorus	Treatment	12627.110	11	2525.422	582.656	0.000
	Error	26.006	11	4.334		
	total	12653.116	11			

The result in table 6 shows that *Trametes vesicolor* is significantly higher in calcium composition and *Xylaria polymorpha* is significantly lower in calcium content. However, there is a significant ($P \geq 0.05$) difference between the calcium compositions of *Xylaria polymorpha* and *Trametes vesicolor*. There is no significant ($P \leq 0.05$) difference in the calcium composition of *Xylaria polymorpha*, *Xylaria hypoxylon* and *Coltricia perennis*. There is also no significant ($P \leq 0.05$) difference in the calcium composition of *Pleurotus sajor cajor* and *Trametes vesicolor*. The result also shows that *Xylaria polymorpha* is significantly ($p \leq 0.05$) higher in magnesium content and *Xylaria hypoxylon* is significantly ($p \leq 0.05$) lower in the magnesium content. However, there is a significant ($P \geq 0.05$) difference between the magnesium content of *Xylaria hypoxylon* and *Coltricia perennis*. There is no significant ($P \leq 0.05$) difference between the magnesium compositions of *Coltricia perennis* and *Auricularia judae* and also no significant ($P \leq 0.05$) difference between the magnesium compositions of Pleurotus sajor cajor and *Xylaria polymorpha.*The result also shows that *Xylaria polymorpha* is significantly higher in phosphorus composition and *Xylaria hypoxylon* is significantly lower. However, there is no significant ($P \leq 0.05$) difference in phosphorus compositions of *Xylaria hypoxylon*, *Auricularia judae* and Coltricia perennis. There is a significant difference between the phosphorus compositions of *Pleurotus sajor cajor, Trametes vesicolor* and *Xylaria polymorpha.*

Table 6: Mean value table showing mean and S.E for the mineral compositions.

Treatment	calcium	magnesium	Phosphorus
P. sajor cajor	0.2900 ± 0.014^{b}	0.46850 ± 0.014^{cd}	64.80500 ± 1.472^{b}
Auricularia judae	0.2790 ± 0.014^{ab}	0.35750 ± 0.014^{b}	45.81000 ± 1.472^{a}
Xylaria hypoxylon	0.2745 ± 0.014^{ab}	0.26400 ± 0.014^{a}	45.39000 ± 1.472^{a}
Coltricia perennis	0.2710 ± 0.014^{ab}	0.31400 ± 0.014^{b}	47.32500 ± 1.472^{a}
Xylaria polymorpha	0.2350 ± 0.014^{a}	0.51500 ± 0.014^{d}	137.7200 ± 1.472^{d}
Trametes vesicolor	0.2930 ± 0.014^{b}	0.44750 ± 0.014^{c}	71.94500 ± 1.472^{c}

IV. DISCUSSION

This study revealed that the phytate level of *Pleurotus sajor cajor* to be 11.535 mg/g, This can be related to the study of Nolovu and Afolayan in 2008 who consider the nutrient level and phytate contents of leaves, fruits and stem of *Corhorus olitorius*. It was discovered that the phytate level in *Corhorus olitorius* is 11.71 mg/g which can be compared with this present study that is 11.535000 mg/g. This study can also be related to that of Adeduntan (2005), who studied the nutritional and anti-nutritional characteristics of some insects foraging in Akure forest reserves, Ondo State, Nigeria. He reported that the phytate composition of Ant is 2030 mg/100g, termite 2482.084mg/100g, *Anaphe venata* 1917.971mg/g and winged termite 1128.227mg/100g. The Phytate content for the winged termite can be related to that of *Pleurotus sajor cajor* 11.535000mg/g of this present study. This implies that *Pleurotus sajor cajor* can be regarded as less toxic and edible because of its low phytate content. It was stated by Fasidi and Kadiri, (1995). That phytate could affect mineral bioavailability when it is 1% or more in diet. The study of phytate needs to be known because high concentration of phytate can cause adverse effect of digestibility and also binds metal ions like calcium, zinc,

iron and other minerals, thereby reducing their availability in the body (FAO, 1990). High level of this can however, be reduced by a number of processing methods like soaking, boiling and fermentation (FAO, 1990).
The oxalate content of *Pleurotus sajor cajor* is 0.855mg/g. This result is closely followed by that of Rathod and Valvi (2011) who studied the anti-nutritional factors of some wild edible fruits from Kolhapur district. It was observed that *Grewia tillifolia* has an oxalate content of 1.01 which can be compared with that of this present study of 0.855mg/g. The low oxalate content of *Pleurotus sajor cajor* implies that it is less toxic and can be regarded as good food supplement.

This present study observed that the tannin composition of *Trametes vesicolor* is 0.116 mg/g and can be related to that of *Chrysophylum africanum* 0.29 mg/100g studied by Christopher and Dosunmu (2011) who studied the chemical evaluation of proximate composition, Ascorbic acid and anti-nutrient content of African star apple (*Chrysophylum africanum*) fruit. This level of oxalate is quite low in the mushroom species. Aletor (1995) noted that high level of tannin intake usually forms insoluble complexes with protein affecting their bioavailability. The tannin content of the mushroom species considered in this study are significantly low ranging from 0.116mg/g to 0.035mg/g, which is lower than the 15.15 of melon husk as reported by Ogbe and George (2012).The ash content of *Xylaria hypoxylon* according to this study is 3.26. This is far more lower than that of *Laccaria amethysta* (32.37), *Macrolepiotata procera* (33.11) and *Laccaria lacata* (33.60) studied by Egwim *et al.* (2011) through the study on the proximate composition, phyto-chemical screening and anti-oxidant activity of ten selected wild edible Nigerian mushroom. This implies that this species cannot be adjudged a good source of mineral food as seen in table 7. The fat content observed for *Pleurotus ostreatus* is 4.89 and is similar to that *Pleurotus sajor cajor* of this present study which is 5.875.

According to table 7, *Pleurotus sajor cajor* has a protein level of 17.50. This higher than that of *Auricularia polytricha* (9.3) as observed by Gbolagade *et al.*(2006). The highest level of crude protein in *Pleurotus sajor cajor* implies that it could be of high protein supply to man and also replace the higher animal protein usually not affordable by the rural community dwellers. Food with high level of protein also helps in rejuvenating or building body tissues, also fighting infections and also transportation of oxygen from the lungs to the rest of the body. can be included in diets to aid protein supply and performs these functions.The crude fibre content of *Xylaria hypoxylon* is 36.525 which is far higher than that of *Auricularia polytricha* which is 9.3. According to this study, The fungi species considered for this study ranges from 36.805 to 2.490 with *Xylaria hypoxylon* being significantly ($P \geq 0.05$) higher in the level of crude fibre and *Auricularia judae* being significantly ($P \leq 0.05$) lower. Considerable fibre content in any food helps the digestive system to function properly and healthy because fibre helps in speeding up the passage of faeces from the body preventing them from sitting in the bowel for too long which could lead to several diseases like colon cancer, coronary heart disease, diabetes, obesity and several digestive disorders (SACH, 2008). Therefore according to this study, *Xylaria hypoxylon* with the highest level of crude fibre could be of good fibre source to help in these health issues.

The calcium content of *Pleurotus sajor cajor, Auricularia judae, Xylaria hypoxylon* is 0.29, 0.279, and 0.274 consecutively. These results are higher than that of grasshopper which is 0.0126 done by Adeduntan (2005). This implies that these mushroom species can serve the calcium needed by man. They can either be consumed alone or combined. They can either be used to compound mineral supplement to supply minerals to man. Calcium helps in the formation of bones and teeth, normal blood clothing, muscle contraction and so on.
The magnesium content of *Xylaria polymorpha, Pleurotus sajor cajor* and *Trametes vesicolor* is 0.515, 0.468 and 0.447. These results are higher than that of tree hopper which is 0.0074 (Adeduntan 2005). The high composition of magnesium in these mushroom species means that they are good supply of magnesium which is necessary for muscle contraction and good nerve function. The phosphorus composition of *Xylaria polymorpha* is 137.72, *Pleurotus sajor cajor* 64.805, *Trametes vesicolor* 71.94, *Auricularia judae* 45.81, *Xylaria hypoxylon* 45.39 and *Coltricia perennis* 47.32. These results are lower compared to that of tree hopper 1224.67, *Anaphe venata* 500 and termite 631.67 (Adeduntan 2005) but they are of considerable amount and they can be combined to food fortified with phosphorus. Phosphorus also helps in the formation of bone and teeth, regulates the release and use of body energy, helps to maintain normal acid/base balance in the body etc.

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