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Influence of Wheat on Nutritional Qualities of *Pleurotus Florida* Cultivation

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----------ABSTRACT----------
This research was under taken with the aim of determining the influence of wheat substrate on nutritional quality of P. florida. Pleurotus florida was cultivated on different wood species (Gmelina arborea and Ceiba pentandra) as source of treatments. The nutritional quality in terms of ash, moisture, fibre, fat and protein content and the anti-nutrient factors such as oxalate, phytate, alkaloid and tannin were also examined. It was discovered that the moisture content of the mushroom is generally high. It was also revealed that the mushroom is an excellent source of protein and fibre. The fibre percentage gotten the mushroom cultivated on Ceiba pentandra substrates is higher than on Gmelina arborea and. Protein content on dry matter basis ranged between 22-47%.

KEYWORDS; *Susbstrate, Mushroom, Pleurotus florida*

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I. INTRODUCTION

Mushrooms are the fruiting bodies of macrofungi. They include both edible/medicinal and poisonous species. However, originally, the word "mushroom" was used for the edible members of macrofungi and "toadstools" for poisonous ones of the "gill" macrofungi. Scientifically the term "toadstool" has no meaning at all and it has been proposed that the term is dropped altogether in order to avoid confusion and the terms edible, medicinal and poisonous mushrooms are used. Edible mushrooms once called the "food of the gods" and still treated as a garnish or delicacy can be taken regularly as part of the human diet or be treated as healthy food or as functional food. The extractable products from medicinal mushrooms, designed to supplement the human diet not as regular food, but as the enhancement of health and fitness (Chang and Buswell, 1996).

The word mushroom may mean different things to different people and countries. It has emerged that specialised studies and the economic value of mushrooms and their products had reached a point where a clear definition of the term "mushroom" was warranted. In a broad sense, "Mushroom is a macrofungus with a distinctive fruiting body, which can be either epigeous or hypogeous and large enough to be seen with naked eye and to be picked by hand" (Chang and Miles, 1992). Thus, mushrooms need not be basidiomycetes, nor aerial, nor fleshy, nor edible. Mushrooms can be ascomycetes, grow underground, have a non-fleshy texture and need not be edible. This definition is not a perfect one but can be accepted as a workable term to estimate the number of mushrooms on the earth. The most common type of mushrooms is umbrella shaped with a pileus (cap) and a stipe (stem) i.e. *Lentinula edodes*. Other species additionally have a volva (cup) i.e. Volvariella volvacea or an annulus (ring) i.e. *Agarius campestris* or with both of them i.e. *Amanita muscaria*. Furthermore, some mushrooms are in the form of pliable cups; others round like golf balls. Some are in the shape of small clubs; some resemble coral; others are yellow or orange jelly-like globs; and some even very much resembles the human ear. In fact, there is a countless variety of forms. The structure that we call a mushroom is in reality only the fruiting body of the fungus. The vegetative part of the fungus, called the mycelium, comprises a system of branching threads and cord-like strands that branch out through soil, compost, wood log or other lignocellulosic material on which the fungus may be growing. After a period of growth and under favourable conditions, the established (matured) mycelium could produce the fruit structure which we call the mushroom. Mushrooms are part of a larger group of plants known as fungi. A fungus is different from an ordinary green plant because it can't make its own food. Fungi have been around since prehistoric days.

Remains of fungi have been found in dinosaur pits! The Egyptian pharaohs (kings) reserved mushrooms for their own plates. It was forbidden for anyone else to eat them. They believed the mushrooms had magical powers. Mushrooms have been considered a delicacy from ancient times. They provide high nutritive value to the diet in the form of proteins, carbohydrates, essential salts and vitamins. As a food item, the nutritive value of mushrooms lies between that of meat and vegetables. Chang (1980) reported that protein content of four popular edible mushrooms such as *Agaricus bisporus, Lentinus edodes, Pleurotus* spp. and *Volvariella volvacea* which are commercially cultivated in various countries ranges from 1.75 to 3.63% of their fresh weight. The fat content in different species of mushrooms ranges from 1.1 to 8.3% on dry weight basis (Chang and Miles, 1993).

II. MATERIALS AND METHODS

STUDY AREA

The substrates were collected at the point of conversion of the logs in Akure. Precisely, the wood (converted to shavings), bark and the sawdust of *Ceiba pentandra* were collected from sawmill at Akad sawmill in Akure while the other (Gmelina sawdust, shavings and bark) substrate was gotten at the Departmental wood workshop and this helped to prevent mixing with other sawdust from another species of wood. The mother spawn was obtained from Forestry Research Institute of Nigeria (FRIN), Jericho Ibadan and was sub-cultured in the Micro- biology laboratory, at Federal University of Technology, Akure, Nigeria.

The materials involved in carrying out this study include;
Sawdust, white and black polythene bags, pressure pot, gas cooker, spatula, bursen-burner, Ethanol (methylated spirit), cotton wool, rubber band, calcium carbonate, transparent bottles, Aluminium foil, clean basin and bucket, transparent ruler, and weighing balance. The following facilities/materials were made use of for the cultivation of ***Pleurotus florida***.

[1] A mushroom-house; a room with proper aeration
[2] Mushroom cultures for the production of spawn
[3] Substrates for spawn production and
[4] Substrate for the cultivation of mushroom

SUBSTRATE PREPARATION

The materials used for the production of the substrate were from different wood species (***Ceiba pentandra*** and **Gmelina arborea**), of different particle sizes (sawdust and wood shavings) and the grinded bark of each wood species. These materials were separately mixed with calcium carbonate; water was also added to them separately and was thoroughly mixed together. 200 g of the mixture was weighed using weighing balance and poured inside white nylon bag tied with rubber band to avoid in- flow of air and passage of water. The bagged substrates were then arranged inside a black polythene bag, properly wrapped and were then put inside a pressure pot and was sterilized for about 1 hour, 30 minutes so as to remove any contaminant that may be present in the substrate (this process is referred to as Pasteurization)

INOCULATION OF SUBSTRATE: After pasteurization, the substrates were then packed having sterilised the hands to be used, into a sterilized bucket with Ethanol (to avoid contamination of the substrate) for cooling. The bagged substrate were then arranged on the Laboratory table (having swapped the table with ethanol and cotton wool and the Bunsen burner was lightened up on the table so as to encourage a sterilized environment and each bag was then inoculated with the prepared planting spawns. The substrates were later transferred to the dark room and covered with a black polythene sheet and were left in the mushroom house till the end of ramification process.
Method of Nutritional Analysis (proximate composition)

This was determined in terms of 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 the difference. Calorific values were obtained by multiplying the values of the crude protein, fat, and carbohydrate contents (except crude fibre) by their physiological fuel values.

Moisture content determination: 5 g of sample was weighed and put inside petridish of a known weight. It was dried in the oven set at 105^0C for 2 hours. The sample was removed and put in the desicator to cool. After cooling, the sample was weighed. It was returned to the oven and was cooled and weighed. Subsequent weighing was done 30 minutes intervals until a constant weight was obtained. The result was calculated thus:

$$\% \text{ Moisture content} = \frac{Moisture\ loss}{Original\ weight\ of\ sample} \times 100$$

Ash content determination

Clean and dry crucibles were weighed using meter balance (PM400) and the weights were recorded (W1). 1g of the sample was weighed into crucibles with samples (W2) and were placed in a muffle furnace and gently heated for combustion. After this, it was heated to 500^0C for 3 hours. Ashing was continued until a light gray ash was obtained. The crucibles and the content were then cooled in a dessicator and weighed (W3).

$$\% \text{ Ash content} = \frac{1 - W2}{W3 - W1} \times 100$$

Fat content determination

The fat content was determined using soxhlet apparatus. About 1g of sample was weighed into a pre-weighed thimble previously dried in an oven and placed in a soxhlet extractor while the mouth was covered with a cotton wool. Petroleum either of boiling point range 60^0C - 80^0C was used as the solvent for extraction. A 500 ml round bottom flask was filled with this petroleum ether to ¾ of the flask. The flask was fitted to soxhlet extractor with a reflux considered and placed on an electro-mantle heater. The extraction began as the solvent refluxed several times. The extraction continued for about 6 hours after which the condenser was detached, the thimble with defatted sample removed, and dried to a constant weight in an oven at 5^0C. The difference between the weight of thimble before and after drying was recorded in order to obtain the extracted. The fat content was then calculated thus:

%Fat content = W eight of fat extracted × 100

Initial weight of sample

Crude Fibre Determination

Crude fibre is the original residues which remain after food sample has been treated under standardized conditions with petroleum spirit, boiling dilute H_2SO_4, boiling dilute NAOH solution, dilute HCL alcohol and ether crude fibre consist of cellulose together with a little lignin. About 1g of the sample was weighed into 1litre conical flask (W), followed by the addition of 200 ml of boiling 25% H_2SO_4. The solution was boiled gently for 30 minutes using cooling fingers to maintain a constant volume. The solution was then filtered through muslin cloth, stretched over 9 cm butcher funnel and mixed with hot distilled water. The residue was scraped back into a flask using a spatula and 200 ml of boiling 1.25% of NAOH was added and solution was allowed to boil gently for 30 minutes with boiling finger used to maintain a constant volume. This was again washed thoroughly with hot distilled water and was rinsed once with 10% HCL and twice with industrial methylated spirit. The residue was rinsed finally three times with petroleum ether (40^0 – 60^0C boiling range) and was allowed to drain, dried and scrapped into the crucible. The residue was dried overnight and then weighed (W3). Ashed at 550^0C for 90 minute in a muffle furnace.

$$\% \text{ Crude fibre} = \frac{W2 - W3}{W1} \times 100$$

Protein Determination

The kjeldhal method was used for the determination of percentage crude protein. The process was in three stages. Digestion: 0.5 g of the samples were weighed into kjeldhal digestion flask and selenium catalyst added. 10 ml concentrated H_2SO_4 was added at this stage. All the carbon present in the sample was converted to carbon (iv) oxide (CO_2), Nitrogen to ammonium sulphate $(NH_4)_2SO_4$, sulphur and phosphorous to their oxides, which are given off gases, the mixture were heated on an electro-thermal heater until solutions were obtained.

Chemical reaction involved during digestion process:

I. $2NH_3 + H_2SO_4 \longrightarrow (NH_4)2SO_4$

II. $C \xrightarrow{O_2} CO_2$

OXIDATION

III. $S \xrightarrow{O_2} SO_2$

Method of Anti-Nutritional Analysis

Determination of oxalate

The determination was done according to Day and Underwood (1986). 1 g of the sample was put into a separate plastic bottle followed by the addition of 75 ml of 1.5 NH_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 treated with

0.1ml $KMnO_4$ while hot ($80^0 - 90^0$C) until a purple colour 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 x 0.9004

Determination of Phytate

For phytate determination, 4 g of samples were soaked in 100 ml of 2% HCL for 3 hours and then filtered. 25 ml of the filtrate was placed in 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 treated with standard Fe_2O solution until a brownish yellow colour persists for 5minutes.

Phytate in mg/100g = titre value x 564.11

Determination of tannin

Gravimetric determination of tannin was done to determine of the sample. 0.2 g of the defatted samples was weighed into test tubes and tannin was extracted in 10 ml of 70% acetone. It was then placed in iced water bath for 10 minutes to allow for complete extraction of tannin. 0.2 ml of the filtrate were placed in test tubes and made up to 1 ml with distilled water. 2.5 ml of 20% of Na_2CO_3 and 0.5 ml of folin's reagent diluted with distilled water were added and the content was mixed properly. The solution was incubated for 45 minutes at room temperature to develop colour (blue colour). 1 ml standard tannic acid solution ranging from 0.01 – 0.05mg/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 wavelength 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 and tannin curve. Effect of *G. arborea* substrates on Ash, Moisture, Protein, Fibre and Fat contents of *P. florida*

III. RESULTS

Table 1 shows the result of the proximate analysis of *P. florida* grown on *G. arborea* substrates cultured with wheat as the source of spawn substrate. It revealed that all the proximate contents are significant ($P \leq 0.05$) in *P. florida* grown on *G. arborea* when wheat is used as the source of spawn substrate

Table 2 revealed that ash content is significantly ($P \leq 0.05$) higher in *P. florida* cultivated on sawdust substrate while it is significantly lower in *P. florida* cultivated on the bark of *G. arborea*. However, there is no mean difference in the ash content of *P. florida* cultivated on Bark and the one cultivated on the wood shaving but there is a mean difference in the ash content of the mushroom cultivated on Sawdust and the one cultivated on wood shaving. Table 3 present the proximate analysis of *P. florida* grown on *C. pentandra* substrates cultured with wheat as the source of spawn substrate, and it shows that only two of this proximate contents (ash and fibre) are significant ($P \leq 0.05$) in the mushroom while other proximate contents are not significant ($P \geq 0.05$). Table 4 presents the effect of *G. arborea* substrates on ash, moisture, protein, fibre and fat contents of *P. florida*. The one grown on bark of G. arborea substrate has higher value for moisture content ,protein and fat content values, while the those grown on sawdust of G. arborea substrate produced the highest value for ash content. Table 5 presents the effect of *C. pentandra* substrates on Ash, Moisture, Protein, Fibre and Fat contents of *P. florida*..

Table 6 presents the significance level of the anti-nutrients (Oxalate, Phytate, Alkaloid and Tannin) present in P. florida grown on *G. arborea* substrates cultured with wheat as the source of spawn substrate. It was discovered that all the anti-nutrients present are significant (P≤ 0.05) in *P. florida* when wheat is used as the source of spawn substrate on *G. arborea* substrates. The result of table 7 shows that Oxalate content is significantly (P≤ 0.05) higher in *P. florida* cultivated on shaving and bark substrates while it is significantly lower in *P. florida* cultivated on the sawdust of *G. arborea*. However, there is no mean difference in the Oxalate content of *P. florida* cultivated on shaving and the one cultivated on the wood bark but there is a significant difference between the sawdust and others. This result also reflects that Phytate content is significantly (P≤ 0.05) higher in *P. florida* cultivated on shaving substrate while it is significantly lower in *P. florida* cultivated on the sawdust of *G. arborea*. There are mean differences in all the treatment i.e. there is mean difference between shaving and Wood bark, and also between Wood bark and sawdust. Alkaloid content is significantly (P≤ 0.05) higher in *P. florida* cultivated on the wood shaving substrate while it is significantly lower in *P. florida* cultivated on the bark of *G. arborea*. There are mean differences in all the treatment in this case i.e. there is mean difference between shaving and Wood bark, and also between Wood bark and sawdust. Tannin content is significantly (P≤ 0.05) higher in *P. florida* cultivated on the wood sawdust substrate while it is significantly lower in *P. florida* cultivated on the bark of *G. arborea*. However, there is no mean difference in the Tannin content of *P. florida* cultivated on shaving and the one cultivated on the wood sawdust but there is a mean difference between the bark and others.

Table 8, indicates the significance level of the anti-nutrients (Oxalate, Phytate, Alkaloid and Tannin) present in *P. florida* grown on *C. pentandra* substrates cultured with wheat as the source of spawn substrate. It was discovered that Alkaloid and Tannin are significant (P≤ 0.05) in *P. florida* when wheat is used as the source of spawn substrate on *C. pentandra* substrates but the other two anti-nutrients (Oxalate and Phytate) are not significant (P> 0.05) in the mushroom.

Table 9 presents the anti-nutritional factor of *P. florida* grown on G. arborea substrates cultured with the spawn substrates used (i.e. *G. arborea* substrates cultured with wheat). The mushroom was cultivated using three replicates for each of the treatment. The values in this table are therefore mean value of the total percentage of each of the anti-nutritional factor present in *P. florida* cultivated on each of the treatment.

Table10 presents the anti-nutritional factor of *P. florida* grown on *C. pentandra* substrates cultured with the spawn substrates used (i.e. *C. pentandra* substrates cultured with wheat). The mushroom was cultivated using three replicates for each of the treatment. The values in this table are therefore mean value of the total percentage of each of the anti-nutritional factor present in *P. florida* cultivated on each of the treatment.

Table 1: ANOVA table for the proximate composition of *P. florida* cultivated on *G. arborea* substrates cultured with wheat as the source of spawn substrate.

Proximate content	Source of variation	Sum of square	df	Mean square	F-value	sig
Ash	Treatment	15.435	2	7.717	44.889	0.000
	Total	16.466	8			
Moisture	Treatment	213.574	2	106.787	145.548	0.000
	Error	4.402	6	0.734		
	Total	217.977	8			
Protein	Treatment	165.992	2	82.996	51.939	0.000
	Error	9.588	6	1.598		
	Total	175.580	8			

Fibre	Treatment	6.605	2	3.302	30.932	0.001
	Error	0.641	6	0.107		
	Total	7.246	8			
Fat	Treatment	12.707	2	6.353	40.782	0.000
	Error	0.935	6	0.156		
	Total	13.641	8			

Table 2: Result of Duncan Multiple Range Test for the proximate content of *P. florida* cultivated on *G. arborea* substrate cultured with wheat as the source of spawn substrate.

Treatments	N	Subset		
		1	2	3
ASH CONTENT				
Bark	3	5.4067		
Shaving	3	6.0400		
Sawdust	3		8.4467	
Sig.		0.111	1.000	
MOISTURE CONTENT				
Sawdust	3	13.1767		
Shaving	3		23.1500	
Bark	3		23.8367	
Sig.		1.000	0.364	
PROTEIN CONTENT				
Sawdust	3	32.1467		
Shaving	3		35.6067	
Bark	3			42.4800
Sig.		1.000	1.000	1.000
FIBRE CONTENT				
Sawdust	3	18.7867		
Bark	3	19.2367		
Shaving	3		20.7867	
Sig.		0.143	1.000	

FAT CONTENT				
Sawdust	3	17.4200		
Shaving	3		19.7167	
Bark	3		20.1167	
Sig.		1.000	0.261	

Table 3: ANOVA table for the proximate composition of *P. florida* cultivated on *C. pentandra* substrates cultured with wheat as the source of spawn substrate.

Proximate content	Source of variation	Sum of square	df	Mean square	F-value	sig
Ash	Treatment	1.067	1	1.067	853.453	0.022
	Error	0.001	1	0.001		
	Total	1.068	2			
Moisture	Treatment	15.137	1	15.137	7.801	0.219
	Error	1.1 6	1	1.940		
	Total	17.077	2			
Fibre	Treatment	193.802	1	193.802	1.196E4	0.006
	Error	0.016	1	0.016		
	Total	193.818	2			
Fat	Treatment	3.197	1	3.197	4.921	0.270
	Error	0.650	1	0.650		
	Total	3.847	2			

TABLE4: Effect of *G. arborea* substrates on Ash, Moisture, Protein, Fibre and Fat contents of *P. florida*

Substrates	Ash (%)	Moisture (%)	Protein (%)	Crude fiber	Fat (%)
Bark + wheat grain	5.41	23.84	42.48	19.24	20.12
Shaving + wheat grain	6.04	23.15	35.61	20.79	19.72
Sawdust + wheat grain	8.45	13.18	32.15	18.79	17.42

TABLE 5: Effect of *C. pentandra* substrates on Ash, Moisture, Protein, Fibre and Fat contents of *P. florida*

Substrates	Ash (%)	Moisture (%)	Protein (%)	Crude fiber	Fat (%)
Shaving + wheat grain	1.45	18.74	47.04	33.68	22.88
Sawdust + wheat grain	2.72	23.51	29.61	16.63	20.69

Table 6: ANOVA table for anti-nutritional factor of *P. florida* cultivated on *G. arborea* substrates cultured with wheat as the source of spawn substrate.

Anti-nutrient content	Source of variation	Sum of square	df	Mean square	F-value	sig
Oxalate	Treatment	0.024	2	0.012	7.723	0.022
	Error	0.009	6	0.002		
	Total	0.034	8			
Phytate	Treatment	9.518	2	4.759	28.080	0.001
	Error	1.017	6	0.169		
	Total	10.535	8			
Alkaloid	Treatment	16.576	2	8.288	1.772E3	0.000
	Error	0.028	6	0.005		
	Total	16.604	8			
Tannin	Treatment	0.188	2	0.094	423.800	0.000
	Error	0.001	6	0.000		
	Total	0.190	8			

Table 7: Result of Duncan Multiple Range Test for anti-nutritional factor of *P. florida* cultivated on *G. arborea* substrate cultured with wheat as the source of spawn substrate.

Treatments	N	Subset		
		1	2	3
OXALATE				
Sawdust	3	0.5667		
Bark	3		0.6767	
Shaving	3		0.6767	
Sig.		1.000	1.000	
PHYTATE				
Sawdust	3	5.3567		
Bark	3		6.1800	
Shaving	3			7.8300
Sig.		1.000	1.000	1.000
ALKALOID				
Bark	3	3.2600		
Sawdust	3		6.0300	
Shaving	3			6.2367
Sig.		1.000	1.000	1.000
TANNIN				
Bark	3	0.9067		
Shaving	3		1.2067	
Sawdust	3		1.2200	
Sig.		1.000	0.315	

Table 8: ANOVA table for anti-nutritional factor of *P. florida* cultivated on *C. pentandra* substrates cultured with wheat as the source of spawn substrate.

Anti-nutrient content	Source of variation	Sum of square	df	Mean square	F-value	sig
Oxalate	Treatment	0.012	1	0.012	3.000	0.333
	Error	0.004	1	0.004		
	Total	0.016	2			
Phytate	Treatment	7.260	1	7.260	21.594	0.135
	Error	0.336	1	0.333		
	Total	7.596	2			
Alkaloid	Treatment	1.500	1	1.500	300.000	0.037
	Error	0.005	1	0.005		
	Total	1.505	2			
Tannin	Treatment	0.135	1	0.135	168.750	0.049
	Error	0.001	1	0.001		
	Total	0.136	2			

TABLE 9: Effect of *G. arborea* substrates on Oxalate, Phytate, Alkaloid and Tannin contents of *P. florida*

Substrates	Oxalate (mg/g)	Phytate (mg/g)	Alkaloid (%)	Tannin (%)
Bark + wheat grain	0.68	6.18	3.26	0.91
Shaving + wheat grain	0.68	7.83	6.24	1.21
Sawdust + wheat grain	0.57	5.36	6.03	1.22

TABLE 10: Effect of *C. pentandra* substrates on Oxalate, Phytate, Alkaloid and Tannin contents of *P. florida*

Substrates	Oxalate (mg/g)	Phytate (mg/g)	Alkaloid (%)	Tannin (%)
Shaving + wheat grain	1.08	11.95	0.80	1.66
Sawdust + wheat grain	0.95	8.65	2.30	1.21

IV. DISCUSSION

Moisture content of the mushroom cultivated on *Gmelina arborea* was analysed. However, moisture content is significant ($P \leq 0.05$) in mushroom when wheat was used as the spawn substrate having a significance value of 0.000, which implies that it has a high moisture content which renders it highly perishable. The result gotten is similar to Chang and Miles 1993 which recorded 90%. Also, these three proximate contents were analysed in the mushroom cultivated using wheat as the spawn substrate and are found significant ($P \leq 0.05$) and follow up test was carried out to know their order of significance The percentage composition of the mushroom cultivated with wheat as spawn substrate on sawdust, wood shaving and bark of *G. arborea* is as follows; percentage ash content: 8.45, 6.04 and 5.41 respectively;

percentage moisture content: 13.18, 23.15 and 23.84 respectively; percentage protein content: 32.15, 35.61 and 42.48 respectively; percentage fibre content: 18.79, 20.79 and 19.24 respectively and the percentage fat content:17.42, 19.72 and 20.12 respectively. The mushroom was also cultivated using wheat as the source of spawn substrate on C. pentandra, it was discovered and it is reported in table 3 that only the ash and the fibre content are significant ($P \leq 0.05$) while the other proximate factor are not significant ($P>0.05$). also in this case, the follow up test could not be performed due to the incompleteness of the replicates which occurred as a result of substrates contamination during the experiment.The percentage composition of the mushroom cultivated with wheat as spawn substrate on sawdust, wood shaving and bark of *G. arborea* is as follows; percentage ash content: 8.45, 6.04 and 5.41 respectively; percentage moisture content: 13.18, 23.15 and 23.84 respectively; percentage protein content: 32.15, 35.61 and 42.48 respectively; percentage fibre content: 18.79, 20.79 and 19.24 respectively and the percentage fat content: 17.42, 19.72 and 20.12 respectively The percentage composition of the mushroom cultivated (but for sawdust and wood shaving only of *Ceiba petandra*) is as follows; percentage ash content: 2.72 and 1.45 respectively; percentage moisture content: 23.51 and 18.74 respectively; percentage protein content: 29.61 and 47.04 respectively; percentage fibre content: 16.63 and 33.68 respectively and the percentage fat content: 20.69 and 22.88 respectively. Protein content on dry matter basis ranged between 22-47% which is also similar to Chang and Mshigeni, 1996, Poppe, 2000 and Kurtzman, 2005 which had a record of 20-40%.

Anti-nutritional analysis was carried out on *P. florida* cultivated on *G. arborea* substrates (shredded bark, wood shavings and sawdust) cultured with wheat as source of spawn substrates and this revealed the level of anti-nutritional factor (Oxalate, Phytate, Alkaloid and Tannin) contained in the cultivated mushroom. The maximum oxalate content of *P. florida* cultivated on *G. arborea* substrates is 0.68mg/g in the fruiting bodies harvested on the wood shaving and shredded bark cultured with wheat as the spawn substrate whereas the least is 0.57mg/g cultivated on the wood sawdust. The highest phytate content of *P. florida* cultivated on Gmelina arborea is found on the fruiting bodies harvested on the shavings of the wood cultured with wheat with the value of 7.83mg/g and the least is recorded with the fruiting bodies harvested on the wood sawdust cultured with wheat grain with the value of 5.36mg/g.

The Alkaloid and the Tannin content of the mushroom cultivated in this experiment is presented in percentage (%). The highest percentage content of Alkaloid in *P. florida* is 6.24% of the fruiting bodies harvested on wood shavings cultured with wheat followed by 6.03 of the fruiting bodies harvested on sawdust cultured with wheat grain while the least is recorded with the bark cultured with wheat having a percentage of 3.26. The highest percentage of Tannin content in *P. florida* cultivated on *G. arborea* is 1.22 of the fruiting bodies harvested on the sawdust of the wood cultured with wheat whereas the least is recorded with the bark of the wood cultured with wheat grain having a percentage of 0.91. The highest percentage content of Alkaloid contained in *P. florida* cultivated on *C. pentandra* is 2.3% of the wood sawdust cultured with wheat and the least is recorded with the one cultivated on the wood shaving cultured with wheat grain having a value of 0.80%. The highest percentage of Tannin content in *P. florida* is recorded with the wood shaving cultured with wheat having a value of 1.66% and the least is recorded with the ones cultivated on the wood sawdust cultured with wheat grains having the value of 1.21%. The highest percentage of phytate content in *P. florida* is recorded with the wood shaving cultured with wheat having a value of 11.95% and the least is recorded with the ones cultivated on the wood sawdust cultured with wheat grains having the value of 8.65%.Oxalates are naturally-occurring substances found in plants, animals, and in humans. In chemical terms, oxalates belong to a group of molecules called organic acid, and are routinely made by plants, animals, and humans. Our bodies always contain oxalates, and our cells routinely convert other substances into oxalates. For example, vitamin C is one of the substances that our cells routinely convert into oxalates. In addition to the oxalates that are made inside of our body, oxalates can arrive at our body from the outside, from certain foods that contain them. Also, oxalate could also be referred to as a salt of oxalic acid, one of which is calcium oxalate Michael, (2002). Oxalate content is not expected to be consumed excessively as much intake of it has the propensity to precipitate (or solidify) in the kidneys or in the urinary tract to form calcium oxalate crystals which contributes to the formation of kidney stones (Michael, (2002). Tannins (commonly referred to as tannic acid) are water-soluble polyphenols that are present in many plant foods. Many tannin molecules have been shown to reduce the mutagenic activity of a number of mutagens. Tannins have also been reported to exert other physiological effects, such as to accelerate blood clotting, reduce blood pressure, decrease the serum lipid level, produce liver necrosis, and modulate immunoresponses as reported by Chung et al. (2001).

V. CONCLUSION

The proximate composition and anti-nutritional factors of *P. florida* was analysed which was able to reflect the ash, protein, moisture, fibre and the fat content of *P. florida* as the proximate composition and oxalate, phytate, Alkaloid and Tannin content of the mushroom which are the anti-nutritional factors analysed in *P. florida.* It was discovered that all the anti-nutritional factors are at a bearable level even with those that are significantly high as they are still within range that could be consumed and will not result to any adverse effect. It also reflect in this study that proximate content contained in this mushroom could make the mushroom serve as supplement to food nutrients.

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