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Physicochemical characterization of seven species of *Termitomyces* collected in Kinshasa, Democratic Republic of the Congo

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ABSTRACT
Objective: Wild edible mushrooms have long been considered foods with low nutritional value. Today, they are providing additional medicinal benefits due to their content of bioactive compounds and nutrients. The aim is to assess their nutritional and therapeutic properties. This study was conducted in Mbankana municipality located in Kinshasa city, Democratic Republic of Congo.
Methodology and results: It analysed seven species of *Termitomyces*, namely *Termitomyces striatus var. aurantiacus* Heim, *T. robustus* (Beeli) Heim, *T. schimperi* (Pat.) Heim, *T. clypeatus* Heim, *T. fuliginosus* Heim, T. striatus (Beeli) Heim, and *T. letestui* (Pat.) Heim, to determine their nutritional value and essential mineral content. ANOVA was applied for different parameters and the significance was at 5%. The findings show that the highest average moisture content is 90.41 ± 0.33% observed in *T. schimperi*, the ash content was higher (8.49 ± 0.03%) for *T. robustus*. Regarding the proteins, the highest average was in *T. robustus* (20.8 ± 0.04%), For fats, the average content is 2.50 ± 0.01% (*T. schimperi*), the carbohydrate content of *Termitomyces* species was higher with *T. clypeatus* (87.1 ± 0.01%). As for fibre, the content is very high in *T. striatus var. aurantiacus* (40.6 ± 0.07%), while the energy value 372.07 calories were higher for *T. clypeatus*. The mineral elements reveal the presence of macro elements in varying quantities, and the presence of trace elements.
Conclusion and application of results: Thanks to their nutritional value, *Termitomyces* can be incorporated into the daily diet of rural and urban populations in the DRC to compensate for the nutritional deficits in animal protein observed in developing countries.
Keywords: Characterization, physicochemical, seven species, *Termitomyces*, Kinshasa

INTRODUCTION

Wild edible mushrooms are ubiquitous Non-Timber Forest Products (NTFPs), occupying virtually all ecological niches and types of terrestrial ecosystems. They are abundant and diverse in forest ecosystems, where they grow in piles, on humus, and on various tree organs, thus representing an important element of biodiversity. They rank second after insects in terms of number of species (Hawksworth, 2001). Fungi are a food source for rural and urban populations, promoting good cardiovascular health (Pedneault, 2007), and are among the non-timber forest products that are free of toxic effects on humans and have a desirable taste and aroma (Mattila *et al.,* 2000). they are also considered a source of numerous bio-compounds with high nutritional, ecological, pharmacological, and medicinal value (Singh *et al.,* 2014). They are a source of animal protein for populations in developing countries (Crissant and Sands, 1978) as well as for vegans. According to Jonhnsy *et al.,* (2011), Kouame *et al.,* (2018), Adebayo *et al.* (2018), wild edible mushrooms are richer than the best vegetables in vitamins, including all those in the B complex (folic acid, ergosterol or provitamin D, thiamine, riboflavin), digestible fibres (mannose, polysaccharides, cellulose, chitinous fibres) and proteins; but also in minerals (potassium, phosphorus, copper, sodium, iron, manganese, calcium, silicon, selenium, etc.) that are essential for human health, with antioxidant and anti-inflammatory properties that protect cells from oxidative stress by increasing the biosynthesis of glutathione (GSH), which is responsible for maintaining cellular redox status (Cortese *et al.,* 2008). For local populations, wild edible mushrooms are considered the meat of the poor because they are a substitute for animal protein. According to nutritional data from Cigal (2020), 100 grams of raw mushrooms provide just 21 calories, 2.4 g of protein, 0.2 g of fat, 1.7 g of dietary fibre, 7.7 mg of calcium, and 341 mg of potassium, which is as much as 60 g of chocolate. They are one of the few non-animal foods that provide vitamin D, which is beneficial against rickets in children and osteoporosis in adults. Dai *et al.,* (2015) report that: daily consumption of mushrooms improves human immunity; Ferreira et al, (2007), confirm that mushrooms are also used in medicine for their biological properties, particularly against cancer, as an antioxidant, cholesterol-lowering agent, and immunostimulant, in comparison with plants. Their consumption has increased, even in developed countries, due to their high protein content and higher trace element content (Thimmel & Kluthe, 1998); they are therefore useful and contribute to the diet, income, and health of the population. However, despite the importance of mushrooms in people's lives, in the Democratic Republic of Congo there is no research on the physicochemical characterization of *Termitomyces*, a genus of wild edible mushrooms that are widely consumed and appreciated by the local and urban populations. This study on the physicochemical characterization of several species of *Termitomyces* fills this gap.

MATERIAL AND METHODS

Study area *:* This study was conducted in the Mbankana neighbourhood in the municipality of Maluku, Tshangu district, Kinshasa province, Democratic Republic of Congo. The municipality of Maluku covers an area of approximately 7,948.8 km² (79% of the city of Kinshasa), with a population density of 23 inhabitants per km². The indigenous population belongs to the Teke tribe. The geographical coordinates are 4°27'41" South and 16°04'43" East, with an altitude ranging from 587 m in the north to 632 m in the south. Geographically, the Mbankana district is located 145 km from downtown Kinshasa on the Batéké Plateau, on National Road No. 1 between Kinshasa and Kikwit. Almost all of the DRC's ethnic groups are found on the Batéké Plateau, including the Bakongo, Baswahili, Bangala, and Baluba. According to the Maluku 2 health zone, the Mbankana district had 70 305 inhabitants in the first half of 2014. The city province of Kinshasa has an AW4 climate according to the Köppen classification (1931), and Mbankana enjoys the same type of climate. It is a humid tropical Sudanese climate with a bimodal rainfall pattern: the first extends from September to December with a rainfall deficit between December and May. The second lasts from March to mid-May, followed by a long dry season between June and September. The average annual rainfall is 1,577 mm (UNDP, 1998). The average temperature fluctuates between 25 and 26°C and can drop from 22°C to 19°C; the temperature of the coldest month is above 18°C, while the nighttime temperature of the hottest month is around 23°C. The relative humidity of the air has a general average of 79%; the maximum average is 93.8% and the minimum average is 54.5% (Ministry of Planning, 2006). According to the WRB (World Reference Base for Soil Resources) classification (IUSS Working Group WRB, (2014); Baert *et al.,* 2009; Ngongo *et al.,* 2009), the soils of the Bateke plateau are Areno-Ferralsols (Dystric). The herbaceous layer of the vegetation covering the largest area is dominated mainly by *Loudetia demeusei* (De Wild.) C.E. Hubb and *Loudetia simplex* (Nees) C.E. Hubb. (Lubini *et al.,* 1988; Pauwels, 1993). The site is savanna and contains a few pockets of gallery forest along the waterways and plantations of *Acacia auriculiformis*; food crops and trade remain the main activities for survival in this part of the city of Kinshasa, which is mistakenly considered a village (Figure 1).

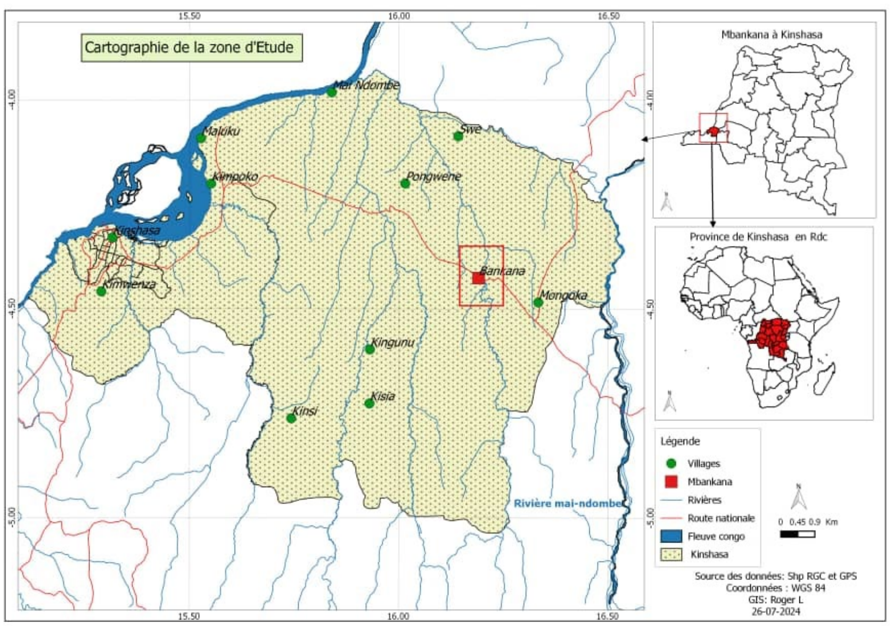

Figure 1: Mapping of the study area

Material: Seven species of *Termitomyces* collected in Mbankana in the Batéké plateau were used as biological material to perform biochemical analyses and determine mineral content; namely: *Termitomyces striatus var. aurantiacus* Heim, *T. robustus* (Beeli) Heim, *T. schimperi* (Pat.) Heim, *T. clypeatus* Heim, *T. fuliginosus* Heim, *T. striatus* (Beeli) Heim, and *T. letestui* (Pat.) Heim.

Methodological approach

Sampling methods: Seven species of *Termitomyces* were selected based on their phenology and availability in the field. After collection, these fungi were sent directly to the laboratory for analysis. For each *Termitomyces* sample, the various analyses were repeated three times.

Determination of moisture and nutritional value of Termitomyces species: The determination of different parameters such as moisture, crude proteins (Kjeldhal's method), fats, ashes, crude fibres, carbohydrates and the energy value was calculated, was performed as the protocol of AOAC (1990). To determine the carbohydrate content, the method used is the deduction recommended by De Groot (1965), whereby the carbohydrate content in 100g of material (fresh or dry) is obtained using the following formula:

% carbohydrates = 100 – (moisture + protein + lipids + ash + fibre) (1)

The energy value is calculated using the specific coefficients of Atwater (1899) for proteins, lipids, and carbohydrates.

A multidimensional analysis of variance was performed to assess significant differences between the parameters determined for each mushroom sample. Multiple comparison tests (Tukey HSD) were conducted when the difference was found to be significant (p).

Methods for determining mineral elements: All elements (ions) were measured using the XEPOS III energy dispersive X-ray fluorescence spectrometer (ED-XRF) (photo 1), using the "FP-Powder" and "Turbo-quant Powder" methods of the XEPOS III spectrometer. The IPE135, IPE 133, and IPE197 standards containing certain elements of interest were used. X-ray fluorescence spectrometry is a multi-element method using four secondary targets, namely molybdenum (39.76 kV voltage and 0.88 mA current), aluminium oxide (49.15 kV voltage and 0.7 mA current), cobalt (35.79 kV voltage and 1 mA current) and finally HOPG Bragg crystal (17.4 kV voltage and 1.99 mA current) from the palladium anode. The sample to be analysed is placed under an X-ray beam. Under the effect of the X-rays, the sample "resonates" and re-emits its own X-rays—this is fluorescence. The energy spectrum of the fluorescent X-rays shows peaks characteristic of the elements. This allows the elements present in the sample to be determined, and the height of the peaks determines the quantity or concentration of these elements.

RESULTS AND DISCUSSION

Proximate analysis of different species identified: The proximate analysis of seven *Termitomyces* is presented in Table 1. It was observed that the moisture content and biochemical analysis of 100 grams (dry matter) *Termitomyces* show that the average moisture content ranges from 80.09 ± 0.2% to 90.41 ± 0.33%; the highest average moisture content is 90.41 ± 0.33% observed in *T. schimperi* (Pat.) Heim and the lowest moisture content is 80.09 ± 0.2% in *T. clypeatus* Heim.

Table 1: Proximate analysis of *Termitomyces* species

Samples	Moisture	Ashes	Proteins	Fats	Carbohydrates	Fibres	Energy /cal.
1	90.07 ± 0.52	8.2 ± 0.00	17.3 ± 0.09	1.3 ± 0.03	32.6 ± 0.03	40.6 ± 0.07	211.03
2	90.7 ± 0.24	8.49 ± 0.03	208 ± 0.04	1.51 ± 0.01	36.7± 0.02	32.48 ± 0.03	243.67
3	90.41 ± 0.33	7.92 ± 0.03	19.65 ± 0.03	2.50 ± 0.01	39.26 ± 0.02	30.67 ± 0.07	258.14
4	80.09 ± 0.2	1.91 ± 0.02	4.57 ± 0.02	0.55 ± 000	87.1 ± 0.01	578 ± 0.03	372.07
5	90.43 ± 0.43	8.36 ± 0.02	15.3 ± 0.06	1.88 ± 0.01	52.2 ± 0.02	22.25 ± 0.05	287.36
6	85.27 ± 0.18	3.53 ± 0.10	4.94 ± 0.00	0.68 ± 0.01	82.4 ± 0.04	8.42 ± 0.03	355.69
7	87.20 ± 0.28	5.44 ± 0.02	7.25 ± 0.00	1.09 ± 0.00	69.2 ± 0.02	17.03 ± 0.03	317.29

(Legend: 1 : *Termitomyces striatus var. aurantiacus* Heim. ; 2 : *T. robustus* (Beeli) Heim. ; 3 : *T.schimperi* (Pat.) Heim. ; 4 : *T.clypeatus* Heim. ; 5 : *T.fuliginosus* Heim. ; 6 : *T.striatus* (Beeli) Heim.; 7: *T.letestui* (Pat.) Heim.)

In terms of ash content, the highest average content is 8.49 ± 0.03% (*T. robustus* (Beeli) Heim) and the lowest average content is 1.91 ± 0.02% observed in *T. clypeatus* Heim. Regarding protein content, the highest average was found in *T. robustus* (Beeli) Heim (20.8 ± 0.04%) and the lowest content in *T. clypeatus* Heim (4.57 ± 0.02%). For fat, the results show that the average content is around 2.50 ± 0.01% (*T. schimperi* (Pat.) Heim) and (0.55 ± 0.00% *T. clypeatus* Heim). Similarly, the carbohydrate content of *Termitomyces* species ranges from 87.1 ± 0.01% (*T. clypeatus* Heim) to 32.6 ± 0.03% for *T. striatus var. aurantiacus* Heim. As for fibre, the content is very high in *T. striatus var. aurantiacus* Heim (40.6 ± 0.07%) and low in *T. clypeatus* Heim (5.78 ± 0.03%). By determining the energy value of these *Termitomyces* species, the results show that the values range from 372.07 calories (1,557.11 kJ) to 211.03 calories (883.16 kJ). *T. clypeatus* Heim has a very high energy value (372.07 calories or 1,557.11 kJ), followed by *T. striatus* (Beeli) Heim (355.69 calories or 1.488,56 kJ); the lowest energy value was found in *T. striatus var. aurantiacus* Heim (211.03 calories or 883.16 kjoules).

Mineral elements: macroelements and trace elements: The mineral content and trace elements are presented in the table below.

Table 2: Determination of mineral elements in *Termitomyces* using the X-ray fluorescence method

N°	Ions	E1	E2	E3	E4	E5	E6	E7	Units
1	Sodium (Na^+)	0.0162	0.0189	0.0284	0.03612	0.0402	0.01294	0.04676	%
2	Magnesium (Mg^{2+})	0.0608	0.0229	0.0197	0.03583	0.0315	0.03918	0.06463	%
3	Aluminium (Al^{3+})	0.00150	0.001820	0.00142	1.859	0.5180	0.8597	0.3965	%
4	Silicon (Si^{4+})	15.75	14.39	22.53	26.28	18.90	27.08	25.53	%
5	Phosphorus (P^{3+})	0.6680	0.7139	0.5197	0.5009	0.4129	0.3811	0.4321	%
6	Sulfide (S^{2--})	0.3929	0.4036	0.2524	0.2199	0.2083	0.09554	0.1644	%
7	Chloride (Cl^-)	0.06351	0.05978	0.05366	0.04121	0.04353	0.02790	0.04479	%
8	Potassium (K^+)	3.633	4.187	2.293	2.095	1.642	1.147	1.610	%
9	Calcium (Ca^{2+})	0.00413	0.01041	0.0089	0.00070	0.00523	0.01353	0.00883	%
10	Titanium (Ti^{2+})	0.2512	0.1991	0.2262	0.2836	0.1941	0.3587	0.3376	%
11	Vanadium (V^{2+})	0.00581	0.00308	0.0039	0.00554	0.00457	0.00624	0.00550	%
12	Chromium (Cr^{3+})	507.4	490.8	430.9	572.3	447.5	217.5	327.5	mg/kg
13	Manganese (Mn^{2+})	98.9	96.5	78.2	100.2	78.3	71.1	94.2	mg/kg

14	Iron (Fe^{3+})	1.986	1.762	1.735	2.125	1.462	2.156	2.214	%
15	Cobalt (Co^{2+})	0.12	0.10	0.24	0.36	0.48	0.13	0.212	mg/kg
16	Nickel (Ni^{2+})	0.263	0.866	0.856	0.275	0.438	0.2315	0.126	mg/kg
17	Copper (Cu^{2+})	12.1	17.7	14.4	11.8	24.5	6.9	13.2	mg/kg
18	Zinc (Zn^{2+})	41.7	62.8	35.2	25.1	28.5	38.9	20.2	mg/kg
19	Gallium (Ga^{2+})	12.1	2.81	10.1	12.8	4.6	10.3	16.7	mg/kg
20	Germanium (Ge^{2+})	< 0.5	< 0.5	< 0.5	< 0.5	< 0.31	<0.0293	< 0.5	mg/kg
21	Arsenic (As^{2+})	< 0.5	< 1	< 0.5	< 0.5	0.022	0.03	< 0.2	µg/kg
22	Selenium (Se^{2+})	< 0.5	< 1.1	< 0.5	< 0.5	0.27	0.131	< 0.5	µg/kg
23	Bromine (Br^{-})	7	4.8	2.5	4.9	0.2	4.3	4	mg/kg
24	Rubidium (Rb^{2+})	50.3	72.4	31.9	33.7	26.3	14.4	19.5	mg/kg
25	Strontium (Sr^{2+})	1.027	1.2	1.35	1.225	1.12	0.021	1.17	mg/kg
26	Yttrium (Y^{4+})	4.1	2.5	4.8	6.1	4.2	8.1	9	mg/kg
27	Zirconium (Zr^{2+})	143.9	< 1	0.65	411	264.7	502	0.00665	mg/kg
28	Niobium (Nb^{2+})	7.3	7	7.4	8.6	7.6	10.4	11.5	mg/kg
29	Molybdenum (Mo^{2+})	< 0.3	1.4	1.4	2.4	2	1.6	22	mg/kg
30	Silver (Ag^{+})	0.018	< 2	5.3	1.8	0.68	7.4	1.2	mg/kg
31	Cadmium (Cd^{2+})	5.1	5.5	5.0	1.1	1.4	4.6	7.3	mg/kg
32	Tin (Sn^{2+})	13.7	1.87	1.78	2.09	2.3	1.93	2.4	mg/kg
33	Antimony (Sb^{2+})	4.5	2.54	2.31	1.29	6.2	2.73	15.4	mg/kg
34	Tellurium (Tl^{2+})	1.4	1.95	1.1	1.091	5.9	0.0299	18.2	mg/kg
35	Iodine (I^{-})	0.012	0.12	0.116	2.67	0.032	0.149	0.0341	mg/kg
36	Cesium (Cs^{2+})	0.0131	< 4.0	< 4	2.11	34.8	0.059	0.041	mg/kg
37	Barium (Ba^{2+})	0.133	0.152	< 2	0.194	0.161	0.178	< 2	mg/kg
38	Lanthanum (La^{2+})	0.15	< 2.0	< 2	0.161	0.65	0.32	0.77	mg/kg
39	Cerium (Ce^{2+})	0.33	0.60	0.17	0.23	0.55	0.37	0.64	mg/kg
40	Praseodymium (Pr^{2+})	0.0282	0.40	0.157	0.23	0.63	0.16	0.14	mg/kg
41	Neodymium (Ne^{2+})	0.232	< 2.0	227	1.75	0.6	3.03	0.254	mg/kg
42	Hafnium (Hf^{5+})	0.0631	0.0020	0.00182	0.00304	0.0023	0.0027	0.0015	mg/kg
43	Tantalum (Ta^{2+})	0.21	0.430	0.47	0.340	0.179	0.162	0.189	mg/kg
44	Tungsten (W^{2+})	0.26	0.143	0.33	0.134	0.43	0.38	0.47	mg/kg
45	Mercury (Hg^{2+})	<1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	mg/kg
46	Thallium (Tl^{2+})	0.03	0.053	0.03	0.053	0.072	< 1.0	< 1.0	mg/kg
47	Lead (Pb^{2+})	0.52	0.30	3.5	9	6.4	2.6	6.3	mg/kg
48	Bismuth (Bi^{2+})	< 1.0	< 1.0	< 1	0.0015	0.009	0.0011	< 1.0	mg/kg
49	Thorium (Th^{2+})	0.74	0.14	0.38	0.52	< 1.0	< 1.0	0.055	mg/kg
50	Uranium (U^{2+})	< 1	< 1.0	< 1	< 1.0	< 1.0	< 1.0	0.013	mg/kg

(Legend: E1: *Termitomyces striatus var. aurantiacus* Heim.; E2: *T. robustus* (Beeli) Heim.; E3: *T. schimperi* (Pat.) Heim.; E4: *T. clypeatus* Heim.; E5: *T. fuliginosus* Heim.; E6: *T. striatus* (Beeli) Heim.; E7: *T. letestui* (Pat.) Heim.)

Table 2 reveals the presence of macroelements such as calcium, phosphorus, potassium, chlorine, sodium, magnesium, etc. in varying quantities, and the presence of trace elements such as iron, zinc, copper, manganese, iodine, molybdenum, chromium, silicon, selenium, gallium, and rubidium, also in significant quantities, not to mention trace elements such as mercury, bismuth, cadmium, lead, and uranium, in negligible quantities in the composition of different *Termitomyces* species.

Comparison of different parameters from proximate analysis: The moisture content and different parameters for the seven species is presented in Table 3.

Table 3 : Moisture content and nutritional values per *Termitomyces*

Parameters	*Termitomyces*							F	P-value
	1	**2**	**3**	**4**	**5**	**6**	**7**		
	Mean± Std	**Mean± Std**	**Mean± Std**	**Mean± Std**	**Mean± Std**	**Mean± Std**	**Mean± Std**		
Moisture	90.1±0.9	90.7± 0.3	90.4±0.5	80.1±0.9	90.4±0.5	85.3±0.3	87.2±0.0	135	<0.001
Ashes	8.2±0.1	8.5± 0.5	7.9±0.1	1.9±0.1	8.4±0.0	3.5±0.1	5.4±0.0	579	<0.001
Proteins	17.3±0.0	20.8±0.0	19.7±0.0	4.6±0.0	15.3±0.2	5.6±1.0	7.3±0.0	628	<0.000
Fats	1.3±0.0	1.5± 0.1	2.5±0.0	0.6±0.0	1.9±0.0	0.7±0.0	1.1±0.0	780	<0.001
Carbohydrates	32.6±0.0	36.7± 0.1	39.2±0.0	87.1±0.1	52.2±0.0	82.4±0.0	69.2±0.2	100266	0.000
Fibres	40.6±0.1	32.5± 0.5	30.7±0.6	5.8±0.2	22.3±0.0	8.4±0.1	17.0±0.2	3717	<0.001

Legend: 1: *T.* striatus *var. aurantiacus*, 2: *T. robustus*, 3: *T. schimperi*, 4: *T. clypeatus*, 5: *T. fuliginosus*, 6: *T. striatus*, 7: *T. letestui*).

For each of these six parameters (moisture, ash, protein, lipids, carbohydrates, and fibre), the results of comparing the overall averages of seven *Termitomyces* species contained in Table 3 show a statistically significant difference between the moisture and nutritional values of these *Termitomyces* (p-value is less than 0.05).

Pair-by-pair Comparison of Termitomyces different species related to biochemical parameters: Table 4 presents the pair-by-pair comparison of moisture between different species.

Table 4: Comparison of different species related to moisture

Termitomyces		**Mean difference**	**Standard error**	**df**	**t**	**p_{tukey}**
A	B	-0.6300	0.481	14	-1.3100	0.837
	C	-0.3400	0.481	14	-0.7070	0.990
	D	9.9800	0.481	14	20.7518	< .001
	E	-0.3600	0.481	14	-0.7486	0.986
	F	4.8000	0.481	14	9.9808	< .001
	G	2.8700	0.481	14	5.9677	< .001
B	C	0.2900	0.481	14	0.6030	0.996
	D	10.6100	0.481	14	22.0618	< .001
	E	0.2700	0.481	14	0.5614	0.997
	F	5.4300	0.481	14	11.2908	< .001
	G	3.5000	0.481	14	7.2777	< .001
C	D	10.3200	0.481	14	21.4588	< .001
	E	-0.0200	0.481	14	-0.0416	1.000
	F	5.1400	0.481	14	10.6878	< .001
	G	3.2100	0.481	14	6.6747	< .001
D	E	-10.3400	0.481	14	-21.5004	< .001
	F	-5.1800	0.481	14	-10.7710	< .001
	G	-7.1100	0.481	14	-14.7841	< .001
E	F	5.1600	0.481	14	10.7294	< .001
	G	3.2300	0.481	14	6.7163	< .001
F	G	-1.9300	0.481	14	-4.0131	0.017

Legend: A= *T. striatus var. aurantiacus*, B= *T. robustus*, C= *T. schimperi*, D= *T. clypeatus*, E= *T. fuliginosus*, F= *T. striatus*, G= *T. letestui*). It should be noted that these comparisons are based on estimated marginal means.

There is a difference in nutritional value with regard to moisture content as follows: A-D, A-F, A-G, B-D, B-F, B-G, C-D, C-F, C-G, D-E, D-F, D-G, E-F, E-G, and F-G ($p < 0.05$). The average moisture content is presented in the figure below.

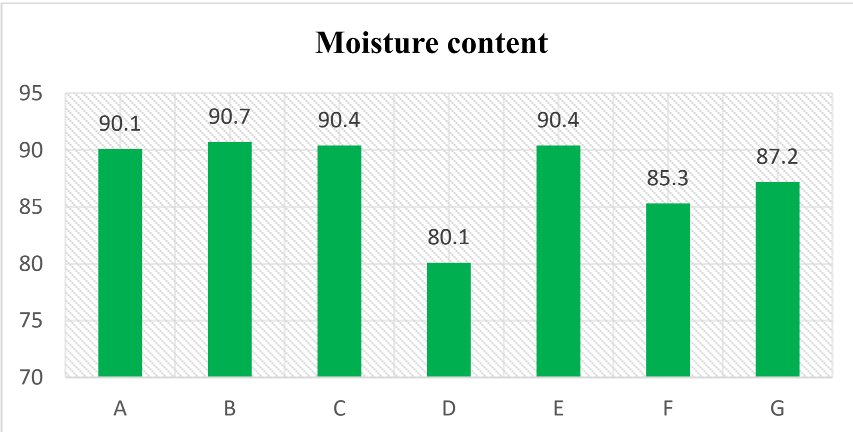

Figure 2: Comparison of moisture content by *Termitomyces*
Legend: A= *T. striatus var. aurantiacus*, B= *T. robustus*, C= *T. schimperi*, D= *T. clypeatus*, E= *T. fuliginosus*, F= *T. striatus*, G= *T. letestui*).

It was observed that *T. clypeatus* showed the lowest moisture content and *T. robustus* had the highest .

Table 5 presents the pair-by-pair comparison of ash between different species.

Table 5: Comparison of different species related to ash

Termitomyces		Mean difference	Standard error	df	T	p_{tukey}
A	B	-0.290	0.157	14	-1.844	0.543
	C	0.280	0.157	14	1.781	0.580
	D	6.290	0.157	14	40.003	< .001
	E	-0.160	0.157	14	-1.018	0.941
	F	4.670	0.157	14	29.700	< .001
	G	2.760	0.157	14	17.553	< .001
B	C	0.570	0.157	14	3.625	0.034
	D	6.580	0.157	14	41.847	< .001
	E	0.130	0.157	14	0.827	0.978
	F	4.960	0.157	14	31.545	< .001
	G	3.050	0.157	14	19.397	< .001
C	D	6.010	0.157	14	38.222	< .001
	E	-0.440	0.157	14	-2.798	0.144
	F	4.390	0.157	14	27.919	< .001
	G	2.480	0.157	14	15.772	< .001
D	E	-6.450	0.157	14	-41.021	< .001
	F	-1.620	0.157	14	-10.303	< .001
	G	-3.530	0.157	14	-22.450	< .001
E	F	4.830	0.157	14	30.718	< .001
	G	2.920	0.157	14	18.571	< .001
F	G	-1.910	0.157	14	-12.147	< .001

Legend : A= *T.striatus var. aurantiacus*, B= *T.robustus*, C= *T.schimperi*, D= *T.clypeatus*, E= *T.fuliginosus*, F= *T.striatus*, G= *T.letestui*)

This table shows a difference in nutritional value with regard to ash as follows: A-D, A-F, A-G, B-D, B-F, B-G, C-D, C-F, C-G, D-E, D-F, D-G, E-F, E-G, and F-G ($p < 0.05$). The average ash content is presented in the figure below.

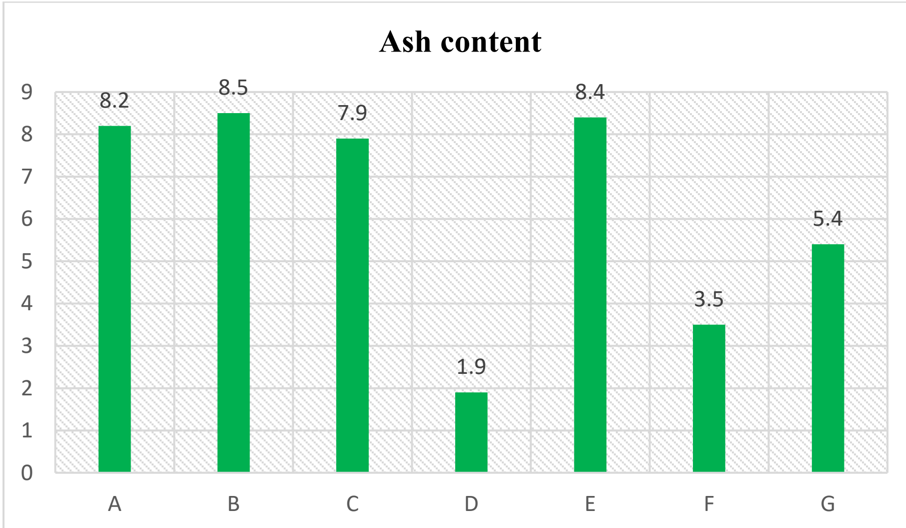

Figure 3: Comparison of ash content by *Termitomyces*
Legend: A= *T. striatus var. aurantiacus*, B= *T. robustus*, C= *T. schimperi*, D= *T. clypeatus*, E= *T. fuliginosus*, F= *T. striatus*, G= *T. letestui*).

The ashes show the mineral richness of a food, and it was observed here that T. clypeatus has the lowest content of ash while *T. robustus* showed the highest content though *T. striatus, T. schimperi* and *T. fuliginosus* show as well a high content of ash. The comparison of different species related to proteins content is provided in the table below.

Table 5: Comparison of different species related to protein content

(I) Assay	(J) Assay	Mean difference (I-J)	Standard error	Sig.	95% Confidence interval	
					Inferior limit	Superior limit
1	2.00	-3.50000*	.39021	.000	-4.3369	-2.6631
	3.00	-2.35000*	.39021	.000	-3.1869	-1.5131
	4.00	12.73000*	.39021	.000	11.8931	13.5669
	5.00	2.00000*	.39021	.000	1.1631	2.8369
	6.00	11.65667*	.39021	.000	10.8198	12.4936
	7.00	10.05000*	.39021	.000	9.2131	10.8869
2	1.00	3.50000*	.39021	.000	2.6631	4.3369
	3.00	1.15000*	.39021	.011	.3131	1.9869
	4.00	16.23000*	.39021	.000	15.3931	17.0669
	5.00	5.50000*	.39021	.000	4.6631	6.3369
	6.00	15.15667*	.39021	.000	14.3198	15.9936
	7.00	13.55000*	.39021	.000	12.7131	14.3869
3	1.00	2.35000*	.39021	.000	1.5131	3.1869
	2.00	-1.15000*	.39021	.011	-1.9869	-.3131
	4.00	15.08000*	.39021	.000	14.2431	15.9169
	5.00	4.35000*	.39021	.000	3.5131	5.1869
	6.00	14.00667*	.39021	.000	13.1698	14.8436
	7.00	12.40000*	.39021	.000	11.5631	13.2369
4	1.00	-12.73000*	.39021	.000	-13.5669	-11.8931
	2.00	-16.23000*	.39021	.000	-17.0669	-15.3931
	3.00	-15.08000*	.39021	.000	-15.9169	-14.2431
	5.00	-10.73000*	.39021	.000	-11.5669	-9.8931
	6.00	-1.07333*	.39021	.016	-1.9102	-.2364

	7.00	-2.68000*	.39021	.000	-3.5169	-1.8431
5	1.00	-2.00000*	.39021	.000	-2.8369	-1.1631
	2.00	-5.50000*	.39021	.000	-6.3369	-4.6631
	3.00	-4.35000*	.39021	.000	-5.1869	-3.5131
	4.00	10.73000*	.39021	.000	9.8931	11.5669
	6.00	9.65667*	.39021	.000	8.8198	10.4936
	7.00	8.05000*	.39021	.000	7.2131	8.8869
6	1.00	-11.65667*	.39021	.000	-12.4936	-10.8198
	2.00	-15.15667*	.39021	.000	-15.9936	-14.3198
	3.00	-14.00667*	.39021	.000	-14.8436	-13.1698
	4.00	1.07333*	.39021	.016	.2364	1.9102
	5.00	-9.65667*	.39021	.000	-10.4936	-8.8198
	7.00	-1.60667*	.39021	.001	-2.4436	-.7698
7	1.00	-10.05000*	.39021	.000	-10.8869	-9.2131
	2.00	-13.55000*	.39021	.000	-14.3869	-12.7131
	3.00	-12.40000*	.39021	.000	-13.2369	-11.5631
	4.00	2.68000*	.39021	.000	1.8431	3.5169
	5.00	-8.05000*	.39021	.000	-8.8869	-7.2131
	6.00	1.60667*	.39021	.001	.7698	2.4436

Legend: 1 = *T. striatus var. aurantiacus*, 2 = *T. robustus*, 3 = *T. schimperi*, 4 = *T. clypeatus*, 5 = *T. fuliginosus*, 6 = *T. striatus*, 7 = *T. letestui*)

The protein averages of seven samples compared in pairs are statistically different at the 0.05% threshold. Figure 4 presents the protein content of *Termitomyces.*

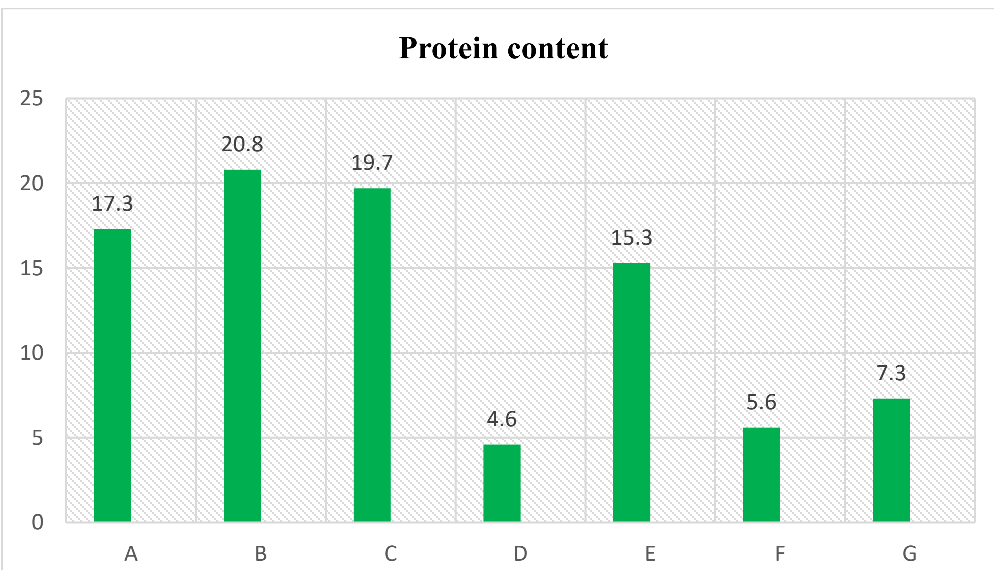

Figure 4: Comparison of proteins content by *Termitomyces*
Legend: A= *T. striatus var. aurantiacus*, B= *T. robustus*, C= *T. schimperi*, D= *T. clypeatus*, E= *T. fuliginosus*, F= *T. striatus*, G= *T. letestui*).

It was observed here that *T. clypeatus* has the lowest content of proteins while *T. robustus* showed the highest content though *T. striatus, T. schimperi* and *T. fuliginosus* show a high content of proteins as well. Table 6 presents the pair-by-pair comparison of lipids between different species.

Table 6: Comparison of different species related to lipids

Termitomyces		Mean difference	Standard error	df	T	p_{tukey}
A	B	-0.210	0.0345	14	-6.09	< .001
	C	-1.200	0.0345	14	-34.78	< .001
	D	0.750	0.0345	14	21.74	< .001
	E	-0.580	0.0345	14	-16.81	< .001
	F	0.620	0.0345	14	17.97	< .001
	G	0.210	0.0345	14	6.09	< .001
B	C	-0.990	0.0345	14	-28.69	< .001
	D	0.960	0.0345	14	27.82	< .001
	E	-0.370	0.0345	14	-10.72	< .001
	F	0.830	0.0345	14	24.06	< .001
	G	0.420	0.0345	14	12.17	< .001
C	D	1.950	0.0345	14	56.52	< .001
	E	0.620	0.0345	14	17.97	< .001
	F	1.820	0.0345	14	52.75	< .001
	G	1.410	0.0345	14	40.87	< .001
D	E	-1.330	0.0345	14	-38.55	< .001
	F	-0.130	0.0345	14	-3.77	0.026
	G	-0.540	0.0345	14	-15.65	< .001
E	F	1.200	0.0345	14	34.78	< .001
	G	0.790	0.0345	14	22.90	< .001
F	G	-0.410	0.0345	14	-11.88	< .001

Legend : A= *T. striatus var. aurantiacus*, B= *T. robustus*, C= *T. schimperi*, D= *T. clypeatus*, E= *T. fuliginosus*, F= *T. striatus*, G= *T. letestui*). It should be noted that these comparisons are based on estimated marginal means.

This table shows a difference in nutritional value with regard to lipids as follows: A-D, A-F, A-G, B-D, B-F, B-G, C-D, C-F, C-G, D-E, D-F, D-G, E-F, E-G, and F-G ($p < 0.05$). The average lipids content is presented in the figure below.

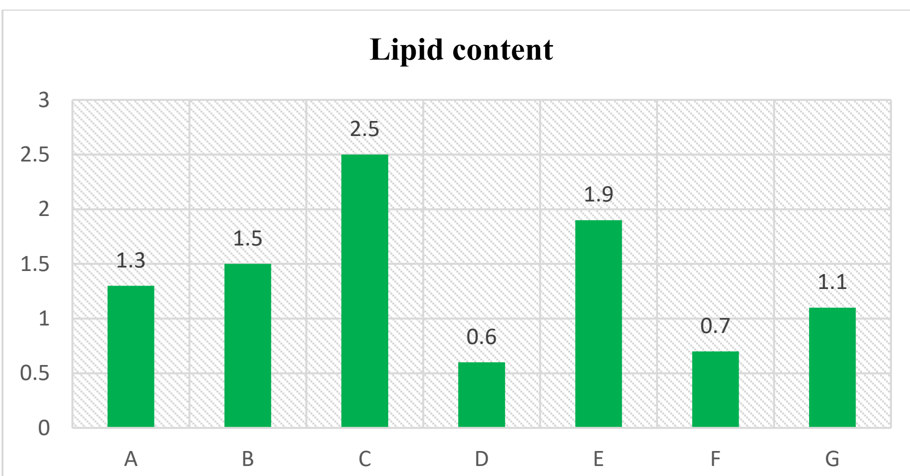

Figure 5: Comparison of lipids content by *Termitomyces*

Legend: A= *T. striatus var. aurantiacus*, B= *T. robustus*, C= *T. schimperi*, D= *T. clypeatus*, E= *T. fuliginosus*, F= *T. striatus*, G= *T. letestui*).

It was observed here that *T. clypeatus* has the lowest content of lipids which was close to *T. striatus* while *T. robustus* showed the highest content. Table 7 presents the pair-by-pair comparison of carbohydrates content between different species.

Table 7: Comparison of different species related to carbohydrates content

Different Species (I)	Comparative assays (J)	Mean differences (I-J)	Standard error	Sig.	95% Confidence interval	
					Lower limit	Higher limit
1	2	-4.10000*	.13801	.000	-4.3960	-3.8040
	3	-6.60000*	.13801	.000	-6.8960	-6.3040
	4	-54.50000*	.13801	.000	-54.7960	-54.2040
	5	-19.60000*	.13801	.000	-19.8960	-19.3040
	6	-49.80000*	.13801	.000	-50.0960	-49.5040
	7	-36.60000*	.13801	.000	-36.8960	-36.3040
2	1	4.10000*	.13801	.000	3.8040	4.3960
	3	-2.50000*	.13801	.000	-2.7960	-2.2040
	4	-50.40000*	.13801	.000	-50.6960	-50.1040
	5	-15.50000*	.13801	.000	-15.7960	-15.2040
	6	-45.70000*	.13801	.000	-45.9960	-45.4040
	7	-32.50000*	.13801	.000	-32.7960	-32.2040
3	1	6.60000*	.13801	.000	6.3040	6.8960
	2	2.50000*	.13801	.000	2.2040	2.7960
	4	-47.90000*	.13801	.000	-48.1960	-47.6040
	5	-13.00000*	.13801	.000	-13.2960	-12.7040
	6	-43.20000*	.13801	.000	-43.4960	-42.9040
	7	-30.00000*	.13801	.000	-30.2960	-29.7040
4	1	54.50000*	.13801	.000	54.2040	54.7960
	2	50.40000*	.13801	.000	50.1040	50.6960
	3	47.90000*	.13801	.000	47.6040	48.1960
	5	34.90000*	.13801	.000	34.6040	35.1960
	6	4.70000*	.13801	.000	4.4040	4.9960
	7	17.90000*	.13801	.000	17.6040	18.1960
5	1	19.60000*	.13801	.000	19.3040	19.8960
	2	15.50000*	.13801	.000	15.2040	15.7960
	3	13.00000*	.13801	.000	12.7040	13.2960
	4	-34.90000*	.13801	.000	-35.1960	-34.6040
	6	-30.20000*	.13801	.000	-30.4960	-29.9040
	7	-17.00000*	.13801	.000	-17.2960	-16.7040
6	1	49.80000*	.13801	.000	49.5040	50.0960
	2	45.70000*	.13801	.000	45.4040	45.9960
	3	43.20000*	.13801	.000	42.9040	43.4960
	4	-4.70000*	.13801	.000	-4.9960	-4.4040
	5	30.20000*	.13801	.000	29.9040	30.4960
	7	13.20000*	.13801	.000	12.9040	13.4960
7	1	36.60000*	.13801	.000	36.3040	36.8960
	2	32.50000*	.13801	.000	32.2040	32.7960
	3	30.00000*	.13801	.000	29.7040	30.2960
	4	-17.90000*	.13801	.000	-18.1960	-17.6040
	5	17.00000*	.13801	.000	16.7040	17.2960
	6	-13.20000*	.13801	.000	-13.4960	-12.9040

Legend : 1 = *T. striatus var. aurantiacus*, 2 = *T. robustus*, 3 = *T. schimperi*, 4 = *T. clypeatus*, 5 = *T. fuliginosus*, 6 = *T. striatus*, 7 = *T. letestui*)

The carbohydrate averages of seven samples compared in pairs are statistically different at the 0.05% threshold. The average carbohydrates content is presented in Figure 6.

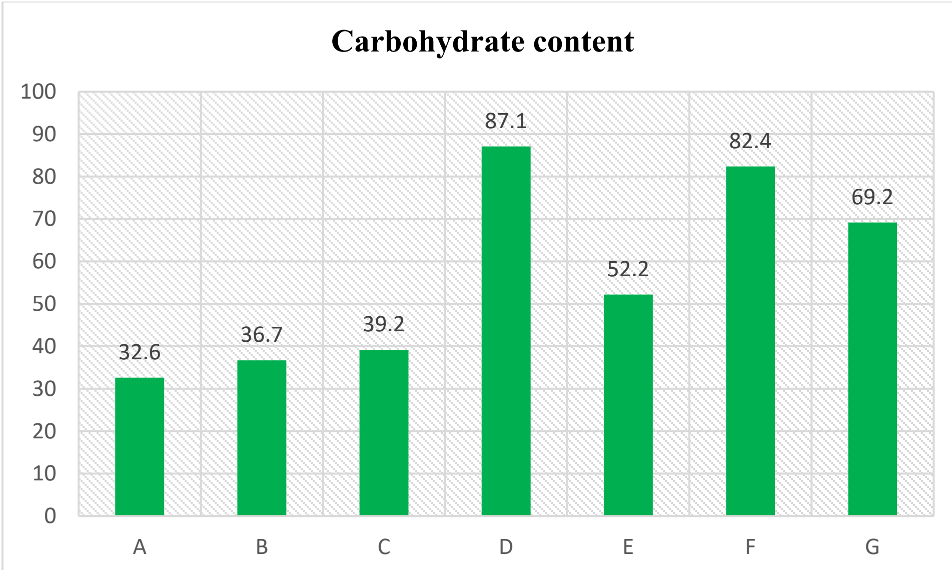

Figure 6: Comparison of carbohydrates content by *Termitomyces*
Legend: A= *T. striatus var. aurantiacus*, B= *T. robustus*, C= *T. schimperi*, D= *T. clypeatus*, E= *T. fuliginosus*, F= *T. striatus*, G= *T. letestui*).

From the above figure, it was *T. clypeatus* had the highest content of carbohydrates along with *T. striatus* while *T. striatus var aurantiacus* showed a lower content of carbohydrates. Table 8 gives the pair-by-pair comparison of fibres between different species.

Table 8: Comparison of different species related to fibres

Termitomyces		Mean difference	Standard error	df	T	p_{tukey}
A	B	8.12	0.300	14	27.09	< .001
	C	9.93	0.300	14	33.13	< .001
	D	34.82	0.300	14	116.17	< .001
	E	18.35	0.300	14	61.22	< .001
	F	32.18	0.300	14	107.36	< .001
	G	23.57	0.300	14	78.64	< .001
B	C	1.81	0.300	14	6.04	< .001
	D	26.70	0.300	14	89.08	< .001
	E	10.23	0.300	14	34.13	< .001
	F	24.06	0.300	14	80.27	< .001
	G	15.45	0.300	14	51.55	< .001
C	D	24.89	0.300	14	83.04	< .001
	E	8.42	0.300	14	28.09	< .001
	F	22.25	0.300	14	74.23	< .001
	G	13.64	0.300	14	45.51	< .001
D	E	-16.47	0.300	14	-54.95	< .001
	F	-2.64	0.300	14	-8.81	< .001
	G	-11.25	0.300	14	-37.53	< .001
E	F	13.83	0.300	14	46.14	< .001
	G	5.22	0.300	14	17.42	< .001
F	G	-8.61	0.300	14	-28.73	< .001

Legend: A= *T. striatus var. aurantiacus*, B= *T. robustus*, C= *T. schimperi*, D= *T. clypeatus*, E= *T. fuliginosus*, F= *T. striatus*, G= *T. letestui*). It should be noted that these comparisons are based on estimated marginal means.

Statistically, this table shows a difference in nutritional value with regard to dietary fibre as follows: A-D, A-F, A-G, B-D, B-F, B-G, C-D, C-F, C-G, D-E, D-F, D-G, E-F, E-G, and F-G ($p < 0.05$). The average fibres content is presented in the figure below.

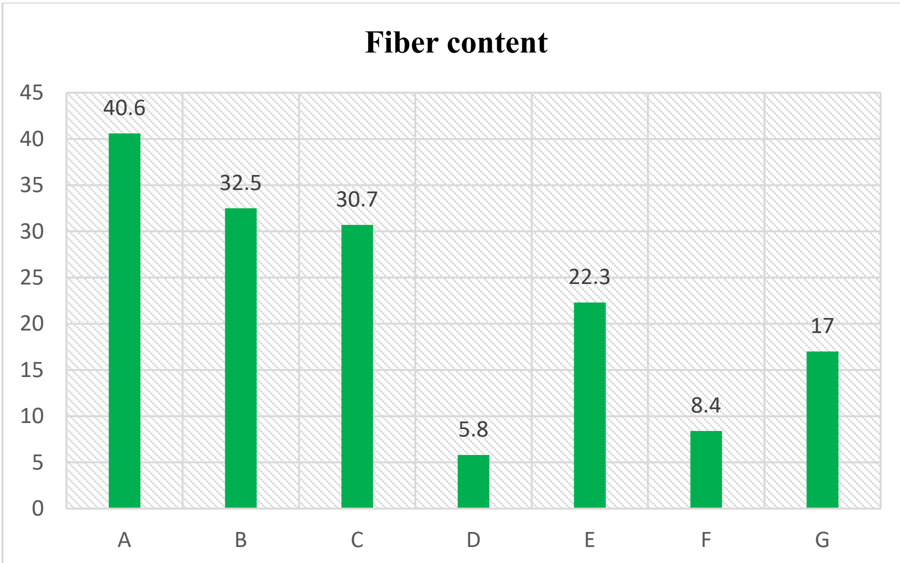

Figure 9: Comparison of fibres content by *Termitomyces*
Legend: A= *T. striatus var. aurantiacus*, B= *T. robustus*, C= *T. schimperi*, D= *T. clypeatus*, E= *T. fuliginosus*, F= *T. striatus*, G= *T. letestui*).

Fibres are non-digestible carbohydrates and are very vital in the process of digestion. It was observed here that *T. striatus var aurantiacus* has the highest content of fibres while *T. schimperi* showed the lowest content though *T. striatus* gives a lower content as well.

DISCUSSION

The biochemical composition of seven species of *Termitomyces* (*T. striatus var. aurantiacus* Heim, *T. robustus* (Beeli) Heim, *T. Schimperi* (Pat.) Heim, *T. fuliginosus* Heim, *T. clypeatus* Heim, *T. striatus* (Beeli) Heim, and *T. letestui* (Pat.) Heim) was determined in order to ascertain their contribution to the diet of the rural and urban populations of Kinshasa city. The findings of this biochemical analysis of seven species of *Termitomyces* presented in Table 1 show that these fungi have an average moisture content ranging from 80.09 ± 0.2% to 90.41 ± 0.33% of fresh weight; the highest average moisture content of 90.41 ± 0.33% is observed in *T. schimperi* (Pat.) Heim and the lowest moisture content of 80.09 ± 0.2% in *T. clypeatus* Heim. The high water content of *Termitomyces* is comparable to all edible wild mushrooms. Dekesel *et al.*, (2002) and Chang *et al.*, (2004) compared the moisture content of mushrooms with that of all vegetables and found that vegetables contain approximately 90% water, similar to mushrooms. The moisture content of seven species of *Termitomyces* in this study shows significant differences in water content, as their p-value is less than 0.001 and therefore also less than 0.05. This difference could be due to certain properties present in these different species of *Termitomyces* (Bram, 2007). The highest average ash content is 8.49 ± 0.03% of dry matter in *T. robustus* (Beeli) Heim, and the lowest is 1.91 ± 0.02% in *T. Clypeatus* Heim. The ash content in *Termitomyces* can be explained by the presence of mineral elements such as calcium, phosphorus, sodium, potassium, magnesium, iron, zinc, manganese, copper, etc., which are present in enzymes with antioxidant functions and are classified as antioxidant micronutrients, thus playing a major role in human health (Bhattacharyya *et al.,* 2014). These findings correspond to those found by Chapon *et al.* (2005), as these authors found that fungi are very rich in mineral elements. This also proves that fungi are generally capable of synthesizing trace elements that will become their source in the food chain (Radulescu *et al.,* 2010; Borovicka, 2013). The ash content also shows significant differences between *Termitomyces* species, as the p-value is less than 0.001, which is also less than 0.05 at the level of the estimated marginal means. As to the proteins, the highest average content was found in *T. robustus* (Beeli) Heim (20.8 ± 0.04%) and the lowest in *T. clypeatus* Heim (4.57 ± 0.02%). These results confirm those found by Cooke (1977), who certifies that 65 kg of mushrooms are comparable to 78 kg of beef in terms of protein content. Furthermore, proteins contained in mushrooms are an important source of amino acids essential for health, such as threonine, valine, and phenylalanine, in quantities equivalent to meat proteins, and slightly lower for isoleucine, leucine, lysine, tryptophan, and histidine. This richness in proteins and amino acids in mushrooms proves their bioavailability in the human body but, above all, makes them a good source of protein for children living in developing countries (Malaise *et al.,* 2008; Malaise, 2010; Giueseppe & Lanzi, 2020). In general, the richness of mushrooms, and *Termitomyces* in particular, in protein and amino acids has also been proven by Diez and Alvarez (2001), who confirm that edible mushrooms contain essential proteins and amino acids at levels that vary considerably from one species to another. This would also statistically explain the significant difference in protein content among the *Termitomyces* species analysed, as the estimated p-value is less than 0.000 and less than 0.05. As to the lipids for the *Termitomyces* species analysed (Table 1) reveal that the average content is around 2.50 ± 0.01% in *T. schimperi* (Pat.) Heim and 0.55 ± 0.00% in *T. clypeatus* Heim; relatively low values in terms of fat content. These results corroborate those of Ulziljargal and Mau (2011); Barros et al. (2008); Lamien-Meda et al. (2004); and Bano and Rajarathnam (1988), which confirm that mushrooms are low in fat with lower energy values. Chang et al. (2004) and Valverde et al. (2015), the fat contained in mushrooms is of the polyunsaturated type, such as linoleic acid, with a value between 2 and 8% of dry weight, which varies according to species; comparable to lean meats such as African chickens (Chang *et al.,* 2004; Valverde *et al.,* 2015). Statistically, a comparison of the lipid content of these *Termitomyces* species shows that there is a significant difference between them, as the p-value, as shown in Table 3, is less than 0.001 and also less than 0.05. The carbohydrates content of seven species of *Termitomyces* in 100g of dry matter is very high in *T. Clypeatus* Heim (87.1±0.01%) and lower in *T. aurantiacus* Heim (4.57±0.03%). This variation in carbohydrates content from one species to another explains why *Termitomyces* are the most popular wild mushrooms among rural and urban populations. These findings are also supported by Chang *et al.,* (2004), who argue that basidiomycete fungi are capable of providing excellent nutritional value in carbohydrates comparable to that of beans and soy milk. The variable carbohydrate content of different *Termitomyces* species corroborates that of Valverde *et al.,* (2015), who found and quantified carbohydrates such as rhamnose, xylose, arabinose, fructose, glucose, mannose, mannitol, sucrose, maltose, and trehalose, which are responsible for the powerful anti-tumour and immunomodulatory properties in different species of higher basidiomycetes, but with variations depending on the species. The presence of these polysaccharides in sufficient quantities would explain the appreciation of *Termitomyces* by rural and urban populations as a king mushroom because it is sweeter than other mushrooms. Guillamon (2010) also points out that mushrooms have low blood sugar and high levels of mannitol, which is particularly beneficial for diabetics. With all these therapeutic properties, *Termitomyces* could be considered a dietary supplement. Statistical analyses comparing estimated marginal means also show a significant difference in carbohydrate content, as p-value = 0.000 < 0.05. As for the presence of fibres with a high content in *T. aurantiacus* Heim (40.6 ± 0.07) and a lower content in *T. clypeatus* Heim (5.78 ± 0.03%). These results corroborate those of Manzi (2004), who states that mushrooms have an appreciable fibre content ranging from 5.5 to 42.6% of the dry weight of the material, in which β-glucans (4 to 13%) and chitin are the most important. Manzi and Pizzoferrato (2000) stated that dietary fibre in mushrooms has a higher level of insoluble dietary fibre. The dietary fibres contained in mushrooms have a higher level of insoluble dietary fibre. These fibres contribute to intestinal regularity and the prevention of constipation by increasing the volume and weight of stools while retaining water in the colon, which also reduces transit time and facilitates evacuation. Statistical analyses comparing the estimated averages of different *Termitomyces* species also showed a significant difference in fibre content, with a p-value of 0.001, which is less than 0.05. Regarding the energy value of seven species of *Termitomyces* analysed show a higher energy value in *T. clypeatus* Heim (372.07 calories) followed by *T. striatus* (Beeli) Heim (355.69 calories); the lowest value is observed in *T. striatus var. aurantiacus* Heim (211.03 calories). This low energy value of *Termitomyces* can be explained by the fact that edible mushrooms provide low amounts of fat, varying according to the species of mushroom, whereas it is lipids that provide higher energy values (Lamien-Meda *et al.,* 2004) This is why mushrooms are considered a dietary product due to their low calorie and lipid content (Agrahar 2005). The results for minerals (Table 2) indicate the presence of minerals such as iron, zinc, copper, potassium, and trace elements, which are numerous and varied, such as selenium, and various heavy metals, metalloids, and radionuclides, which vary from one species to another. The factors contributing to this difference in the bioaccumulation of *Termitomyces* are thought to be natural factors related to the fungal environment, such as geochemical basis, mineral regions, and environmental pollution. Furthermore, the process of trace element bioaccumulation in macrofungi is highly specific to elements with similar or homologous characteristics and chemical behaviour (Falandysz & Borovicka, 2013; Vunduk *et al.,* 2014). These results coincide with the observation made by Yoshida & Muramatsu (1994) that all basidiomycetes appear to be capable of bioaccumulating various heavy metals, metalloids, and radionuclides, which can then enter the food chain via the animals that consume them, eventually reaching humans. Hence the need to avoid consuming mushrooms of unknown origin.

CONCLUSION AND APPLICATION OF RESULTS

In this study, physicochemical analyses was performed on seven species of *Termitomyces*, namely *T. striatus var. aurantiacus* Heim, *T. robustus* (Beeli) Heim, *T. schimperi* (Pat.) Heim, *T. clypeatus* Heim, *T. fuliginosus* Heim, *T. Striatus* (Beeli) Heim, and *T. letestui* (Pat.) Heim. This study shows that these wild edible mushrooms have a very high moisture content, ranging from 80.09 ± 0.2% to 90.41 ± 0.33%. This high moisture content could be an obstacle to their long-term preservation. They are low in fat, with a content ranging from 0.55 ± 0.00 in *T. clypeatus* Heim to 2.50 ± 0.01 in *T. Schimperi* (Pat.) Heim, and low in calories, with a high value of 372.07 calories in *T. clypeatus* Heim. They are rich in ash, with values ranging from 1.91 ± 0.02% in *T. clypeatus* Heim to 8.49 ± 0.03% in *T. robustus*

(Beeli) Heim. *Termitomyces* are also rich in protein, with values ranging from 4.57 ± 0.02% in *T. clypeatus* to 20.8 ± 0.04% in *T. robustus* (Beeli) Heim; they are also rich in simple carbohydrates, with values ranging from 32.6 ± 0.03% in *T. striatus var. aurantiacus* Heim to 87.1 ± 0.01% in *T. clypeatus* Heim; they are also rich in insoluble dietary fibre, with a content ranging from 5.78 ± 0.03% in *T. clypeatus* Heim to 40.6 ± 0.07% in *T. aurantiacus* Heim. Statistical comparison of these physicochemical parameters using multivariate analysis revealed significant differences in the composition of these seven *Termitomyces* species, which could be linked to the substrates (compost composition, soil composition, termite species) used for the growth of these fungi. Thanks to their nutritional value, *Termitomyces* can be incorporated into the daily diet of rural and urban populations in the DRC to compensate for the nutritional deficits in animal protein observed in developing countries. *Termitomyces*, like all other fungi, are foods that are low in calories and fat, capable of rebalancing or supplementing high-fat meals, and can be incorporated into diets or used in the food industry to enrich certain foods in order to facilitate their adoption and integration into the daily diet. *Termitomyces*, like all other fungi, are foods that are low in calories and fat, capable of rebalancing or supplementing high-fat meals. They can be incorporated into diets or used in the food industry to enrich certain foods, facilitating their adoption and integration into daily diets. In addition, their bioactive compounds offer enormous benefits for human health which would reduce the risk of disease and prevent the treatment of several chronic diseases, such as cancer, cardiovascular disease, diabetes mellitus, and neurodegenerative diseases, as the saying "food is medicine" is truer than ever, not only for the elderly but also for poor populations.

Conflict of interest

The authors declare that there are no conflicts of interest.

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