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Nutritional value of five edible wild mushrooms most commonly consumed in the city of Man (Côte d'Ivoire)

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Abstract

Mushrooms are generally used by rural populations during lean periods to replace meat, fish and vegetables. This study was conducted with a view to adding value to wild mushrooms, particularly those most commonly consumed in Man (*Termitomyces titanicus*, *Termitomyces letestui*, *Volvariella volvacea*, *Auricularia cornea* and *Psathyrella tuberculata*). The chemical composition and nutritional value of each species were determined. The five edible mushroom species are energy-dense foods (190.49 Kcal/100g to 335.84 Kcal/100g), rich in carbohydrates (31.17 g/100g to 56.57g/100g), proteins (13.19 g/100g to 39.69 g/100g) and ash (4.46 g/100g to 23.35 g/100g). These mushrooms are therefore good sources of protein and carbohydrates in the diet. However, the moisture and acidity of these mushrooms mean that the various traditional methods of preservation are of interest.

Keywords: Edible mushrooms; Chemical composition; *Termitomyces titanicus*; *Termitomyces letestui*; *Volvariella volvacea*; *Auricularia cornea*; *Psathyrella tuberculata*

1. Introduction

Edible wild mushrooms are non-timber forest products that play an essential role in the diet of rural populations and contribute to their well-being (Yian and Tiébré, 2018). In Africa, edible mushrooms make a substantial contribution to the diet. They also play a fundamental role in the health of all forest ecosystems (Boa, 2006). In addition, edible wild mushrooms make a major contribution to the lives of African populations, who use them as an example, especially in rural West Africa (Yorou et *al*., 2013). As well as being consumed, this resource is marketed, thus constituting a source of income for the populations (Härkönen et *al*., 2015). In Côte d'Ivoire, mushrooms are consumed by a large proportion of the rural population (N'Douba et *al*., 2021). Mushrooms are harvested during their fruiting periods to be used or sold by rural populations to meet their family needs (Kouame et *al*., 2018). They are most often used during lean periods to replace meat, fish and vegetables (Kouame et *al*., 2018). However, urban dwellers regard wild edible mushrooms as foods with little nutritional value, and the fact that they are not highly valued hampers the development of local production (Pedneault, 2007). The wild edible mushrooms most commonly consumed in the town of Man are not very highly valued in nutritional terms. The aim of this study is to enhance the nutritional value of wild edible mushrooms.

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2. Materials and Methods

2.1. Plant Materials

Five (5) edible mushrooms were used following a survey of households in the town of Man. These were *Termitomyces titanicus, Termitomyces letestui, Volvariella volvacea, Auricularia cornea* and *Psathyrella tuberculata*.

2.2. Sampling

Fresh samples of the wild mushrooms selected were collected at random from the various markets in the town of Man.

2.3. Chemical composition

Moisture, ash, lipid, protein contents and carbohydrate were determined using standard methods (AOAC, 1990). Total polyphenols were determined spectrophotometrically, using the colorimetric method using the Folin-Ciocalteu reagent (Skerget et *al*., 2005). Total energy was calculated according to the following equations (Manzi et *al*., 2004):

Energy (Kcal) = 4 x (g protein + g Carbohydrate) + ¼ 9 (g Lipid)

2.4. Statistical analysis

Two types of statistical analysis were used for data processing. These are ANOVA and Tukey's test for averaging. Both of these analyses were done by the SPSS software. The meaning is accepted at a level of 1 % (P ≤ 0.01)

3. Results

The results of the chemical composition and estimated energetic value obtained for the five mushroom species are shown in Table 1. Moisture content ranged from 7.73 g/100g (*Psathyrella tuberculata*) to 58.73 g/100g (*Volvariella volvacea*). There were significant differences in moisture content for all mushrooms studied. Differences were significant in ash content for all fungi except between *Auricularia cornea* (4.46 g/100g) and *Termitomyces titanicus* (4.79 g/100g). There were significant differences in lipid content except between *Psathyrella tuberculata* (5.03 g/100g), *Volvariella volvacea* (4.58 g/100g) and *Termitomyces letestui* (5.49 g/100g) and between *Auricularia cornea* (2.13 g/100g) and *Termitomyces titanicus* (1.45 g/100g).

Table 1 Proximate chemical composition and energetic value of five wild edible mushrooms sold at the market in the city of Man (Ivory Coast)

	Moisture (g/100g)	**Ash (g/100g)**	**Lipid (g/100g)**	**Protein (g/100g)**	**Carbohydrates (g/100g)**	**Total polyphenols**	**Energy value(Kcal)**
Psathyrella tuberculata	7.73 ± 0.03 [a]	23.35 ± 0.35 [a]	5.03 ± 0.07 [a]	39.69 ± 0.18 [a]	34.19 ± 0.19 [a]	0.84 ± 0.05 [a]	340.82 ± 2.11 [a]
Auricularia cornea	29.50 ± 0.29 [b]	4.46 ± 0.01 [b]	2.13 ± 0.07 [b]	15.51 ± 0.51 [b]	38.73 ± 0.40 [b]	0.07 ± 0.06 [b]	302.84 ± 4.31 [b]
Volvariella volvacea	58.73 ±0.24 [c]	6.79 ± 0.29 [c]	4.58 ± 0.51 [a]	16.85 ± 0.07 [c]	43.05 ± 0.08 [c]	0.83 ± 0.10 [ac]	280.82 ± 5.19 [b]
Termitomyces letestui	12.79 ±0.13 [d]	10.22 ± 0.19 [d]	5.49 ± 0.05 [a]	14.96 ± 0.03 [b]	56.57 ± 0.51 [b]	0.69 ± 0.04 [ab]	335.53 ± 6.66 [a]
Termitomyces titanicus	49.40 ± 0.10 [e]	4.79 ± 0.18 [b]	1.45 ± 0.00 [b]	13.19 ±0.27 [d]	31.17 ± 2.02 [a]	0.90 ± 0.08 [a]	190.49 ±9.16 [c]

Means followed by the same letter in the same row are not significantly different at P = 0.01.

There are significant differences in protein content between samples, except that there is no significant difference between *Auricularia cornea* (15.51 g/100g) and *Termitomyces letestui* (14,96 g/100g). There are significant differences in carbohydrate content between mushrooms, except that between *Psathyrella tuberculata* (34.19 g/100g) and *Termitomyces titanicus* (31.17 g/100g) and between *Auricularia cornea* (38.73 g/100g) and *Termitomyces letestui* (56.57 g/100g) this difference is not significant. The total polyphenol content of mushrooms is significantly non-different except between *Psathyrella tuberculata* (0.84 g/100g) and *Auricularia cornea* (0.07 g/100g), between

Auricularia cornea (0.07 g/100g) and *Volvariella volvacea* (0.83 g/100g), between *Auricularia cornea* (0.07 g/100g) and finally between *Termitomyces titanicus* (0.91 g/100g). The energy values of the mushrooms are significantly different except between *Psathyrella tuberculata* (340.82 Kcal) and *Termitomyces letestui* (335,53 Kcal) and between *Auricularia cornea* (302.84 Kcal) and *Volvariella volvacea* (280.82 Kcal).

4. Discussion

This study showed that the mushrooms analysed have a moisture of between 7.73 g/100g and 58.73 g/100g. *Volvariella volvacea* had the highest moisture. The same observations were made in the Haut-Sassandra region with regard to the moisture content of *Volvariella volvacea* (Kouame et *al*., 2018) but with a lower value (16.22 g/100g). The differences in moisture content of the mushroom species studied could be due in part to variations in drying methods. Sun-drying is an easy, quick and safe method that preserves certain sensory and nutritional properties of mushrooms, and could be the cause of the different variations in moisture content (Bram, 2007).

What's more, all five mushroom species contain polyphenols (from 0.07 to 0.90 mg/g), which have antioxidant activity. As antioxidants, polyphenols can improve cell survival. Similarly, as pro-oxidants, they can induce apoptosis and prevent tumour growth, and fight bacterial and viral infections through direct oxidative damage or a variety of innate and adaptive mechanisms. (Paiva et Bozza, 2014).

The relatively high protein content (0.51% - 39.69%) and carbohydrate content (13.04% - 65.04%) of the five mushrooms would explain their use during lean periods as a substitute for meat, fish and vegetables (Kouame et *al*., 2018). The high carbohydrate content of *Auricularia cornea* (65.05%) confirms the study by Kanga et *al*. (2021). Mushroom protein contains almost all the essential amino acids at levels that vary considerably from one species to another (Diez and Alvarez, 2001). *Volvariella volvacea*, *Psathyrella tuberculata and Termitomyces letestui* are thought to provide an excellent protein and carbohydrate nutritional value comparable to that of milk, soya and beans (Chang and Miles, 2004). The high protein and carbohydrate content indicates that the mushroom species studied are energy foods. The energy value of these mushrooms, ranging from 160.82 to 350.88 kcal/100 g, is an indicator of this. According to the work of Chapon et *al* (2005), the energy value of edible mushrooms could vary from 250 to 400 kcal/100g.

In general, edible mushrooms are low in fat. This makes them well suited to low-calorie diets (Mattila, 2001), helping to reduce the obesity complained of particularly by people in their forties (Manohar et *al*., 2002). The fat content (1.45% - 5.49%) of the mushroom species studied is roughly equal to that obtained by Kouame et *al*. (2018) for certain species such as *Volvariella volvacea* (4.58%) and *Termitomyces letestui* (5.49%). The very high percentage of *Psathyrella tuberculata* can be explained by the fact that shopkeepers add oil to make the mushrooms shine in order to attract customers.

The ash content of the mushrooms analysed ranged from 4.79 to 23.35%. The highest ash content was found in *Psathyrella tuberculata*. This shows that the mineral content of mushrooms depends on the species, the state of maturity and even the bio-accumulative capacity (Chapon *et al.,* 2005; Aaronson, 2000).

5. Conclusion

Biochemical parameters have shown that *Psathyrella tuberculata, Volvariella volvacea, Termitomyces letestui and Termitomyces titanicus* are nutritious, high-energy foods. The presence of total polyphenols in these five mushrooms justifies their therapeutic importance, which is why they should be incorporated into the diet to make the most of their beneficial effects.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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