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Ethnomycological Investigation and Domestication of Wild Edible Mushrooms from the Department of Bamboutos (West Cameroon)

Kamgoue Ngamaleu Yves Bertin[1,4], Sumer Singh Rathore[1], Sudhanshu Mishra[2], Donkeng Voumo Sylvain meinrad[3], Prashakha Jyotiprakash Shula[1], Nanda Djomou Giresse Ledoux[4], Ladoh Yemeda Christelle Flora[4], Essouman Ebouel Pyrus Flavien[5], Wamba Fotso Oscar[4], Asseng Charles Carnot[4,6]

Faculty of Science, Department of Microbiology, Gokul Global University, India.[1]
Nims University Rajasthan, Jaipur, India[.2]
Faculty of Science, Department of Environmental Science, Gokul Global University, India.[3]
University of Douala Cameroon, Laboratory of Biology and Physiology of Plant Organisms.[4]
University of Dschang Cameroon, Department of Forestry.[5]
Higher Institute of Agriculture, Wood, Water and Environment of the University of Bertoua at Belabo, East Cameroon.[6]

Abstract- Food security remains one of the major problems in the world. Wild edible mushrooms constitute an important source of food due to their nutritional and medical values, as well as a source of income for populations. This study aims to domesticate wild edible mushrooms that grow in the Bamboutos department. An ethnomycological survey was conducted among 154 people through direct and semi-structured interviews in the 04 Districts and in 15 villages of the Department. The macroscopic identification of the different species was carried out in situ using identification keys. The domestication test was carried out in the laboratory, the species inoculated on PDA medium and transplanted onto cereal seeds then onto corn cobs in order to obtain seeds. The seeds obtained were tested on corncob and sawdust substrates with the use of two additives, wheat bran and corn bran.The different substrates composed of slaked lime, urea, fungicide and water. This work reveals that the largest percentage of respondents is made up of men (65%). Knowledge related to the edibility of mushrooms is mainly transmitted by family members (68%). The wild edible mushrooms collected (04 species) belong to the Lyophyllaceae family and the Termitomyces genus: Termitomyces letestui, T. striatus, T. aurantiacus and T. brunneopileatus. The seed production process was a complete success. The substrate made up of corn stalks and wheat bran presented the best weights at harvest (221,66±3,36 g , 89,24±3,74 g and 93,58±7,13g). However, the carpophores obtained from the harvested and cultivated species were undifferentiated.

Index Terms- Wild fungi, ethnomycological investigation, domestication, Termitomyces.

I. INTRODUCTION

Tropical ecosystems are full of enormous natural resources, notably non-timber forest products, including wild edible mushrooms. Edible mushrooms constitute an important part of tropical forest products. Certain groups are endemic there, but are unfortunately not well known and underexploited. They are abundantly gathered, consumed and marketed during the rainy seasons (Teke, et al., 2018). The process of bringing wild edible mushrooms into cultivations is called domestication who is gaining popularity in the world, but only around 30 species are in cultivation. Termitomyces are the most preferred species that form a favorite delicacy for most African and Asian communities. Their good flavor, good taste, their texture and the symbiotic association with termites make them unique (Jay Kant, 2019; Kabacia & Muchane, 2023).The high concentration of vitamins, minerals, and proteins in mushrooms makes them ideal as nutritional foods. Proteins of mushrooms contain all the essential amino acids. Likewise, they have important medicinal properties including antimicrobial, antioxidant and many other properties (Bakratsas, Polydera, Katapodis, & Stamatis, 2021; Kamgoue Ngamaleu & Prashakha Jyotiprakash, 2024). World production of edible mushrooms was 44 million tonnes and it continues to increase, the Asian continent is the main producer (Shweta & Sharma, 2023).Several works have been carried out on ethnomycological studies in Africa in general. It has been widely reported that 3000 are used in food and over 100 have various medicinal properties (Bakary, et al., 2019; Fadeyi, et al., 2017; Mossebo, Essouman, Machouart, &

Gueidan, 2017; Kabacia & Muchane, 2023).Previous studies have demonstrate the presence of wild edible mushroom in different region of Cameroon, 8 species were defined as edible and therefore Termitomyces were highlighted for their culinary value and Ganoderma for traditional health care (Teke, et al., 2018). A total of 75 species of mushrooms belonging to 30 families were identified during the study in the Awing Forest Reserve in Northwest Region. This included 7 species from the Ascomycota and 68 from the Basidiomycota, so the most utilized species as food and medicine was species of the genus Termitomyces occurring Termitomyces titanicus (Tonjock, Nkengmo, Theobald Mue, Ache Neh, & Afui, 2017). 40 species of wild edible mushrooms have been identified as edible by people from Bamoun. The most common species found in the study is from the genus Termitomyces, which is noted for its diversity, with 10 species used by the Bamoun people. Termitomyces species are particularly significant as they have a symbiotic relationship with termites and are widely consumed in tropical regions, including Cameroon (Njouonkou, et al., 2016). In humid forest of Cameroon, 117 wild edible mushroom species belonging to 17 families and 43 genera. This includes nearly 22 species of Termitomyces, 32 ectomycorrhizal species, and 63 saprophyte species (Onguene & Kuyper, 2019), 94 species in humid forest of South Cameroon (Onguene Awana, Tchudjo Tchuente, & Kuper, 2018). Recent advancements in the field of Mycology have revealed that wild edible mushroom can be domesticate (Nteziryayo, Tibuhwa, Kiyuku, Muvunyi, & Masharabu, 2019; Pitta, Yian, Adjessi, & Tiebre, 2020; Shahtahmasebi, et al., 2018). Much work has been carried out in Africa and around the world on wild edible mushrooms in symbiosis with termites, which are of capital importance and have particular specificities and therefore there are only 30 species in this group of mushrooms (Mossebo, Essouman, Machouart, & Gueidan, 2017; Kabacia & Muchane, 2023). In recent years, accelerated deforestation of plant cover, alteration of biodiversity and the effects of climate change have influenced the seasonal availability of mushrooms. These factors lead to the scarcity of mushrooms and influence harvests and sales in local markets (Kamou, et al., 2017; Yian, Pitta, & Tiebre, 2020). However, domestication is an alternative to overcome all these problems. This work focuses on the valorization of wild edible mushrooms in the world, because by finding the techniques and methods to successfully cultivate these Termitomyces species, it will be a great progress in research. It will therefore be possible to have them at any time of the year without climatic constraints.

II. MATERIALS AND METHODS

1. Presentation of the Study Area

The Bamboutos department extends from the summit (2740 m) of this mountain to the Noun plain (1200 m). Located in the heart of the Western Highlands, extends between 5° and 6° North latitude and between 9° and 11° East longitude. It is limited to the north by the Mezam, to the south by the Mifi and the Menoua, to the east by the Menoua and the Manyu, and to the west by the Noun with an area of 1155 km2. The Bamboutos have four districts including: Babadjou, Batcham, Galim and Mbouda represented by 16 groups (Tsewoue, Tchamba, Avana, & Tanougong, 2020). The soils are volcanic and rich, constituting the Department's primary natural resource. The vegetation consists of savannah. The humid Cameroonian climate is characterized by a rainy season which lasts almost 8 months with a relatively moderate total rainfall (around 1600 mm of rain per year). It has two seasons: a rainy season which goes from March-April to October, with the maximum in July-August (from 200 to 300 mm of water in 17-23 days) and a dry season which goes from November to March with low temperatures. The Bamboutos constitute an area of the high plateaus, with an altitude above 1100 m. The relief is very diverse. Hydrography, the eastern slope of the Bamboutos Mountains is drained by the Mifi-Nord basin. In the upper zone, the hydrographic network is subparallel, radial and dense. The middle zone and the low zone are characterized by a subdendritic hydrographic network. The relative humidity in the department is between 70 to 80% (Lontuo-Fogang, et al., 2021; Akhere Gwan, Ndzifon Kimengsi, & Nji Fowe, 2021; Leumbe Leumbe, Bitom, Tematio, Temgoua, & Lucas, 2005)

Figure 1: Study area (Kamgoue Ngamaleu, Ethnomycological study and test of domestication of some edible wild Mushroom harvested in the Department of Bamboutos (West - Cameroo), 2022)

Ethnomycological Surveys

The ethnomycological surveys were conducted from March to April 2021 in the 4 districts of the Department: Mbouda, Batcham, Babadjou and Galim as well as in 15 villages in these districts: Babadjou, Bafounda, Baden, Badjuindji, Bamendjo, Bantang, Bamoussam, Batcham, Bagang, Bamougno, Balatchi, Balena, Baloumgou, Galim market, Bagam. The study was based on a semi-structured survey. The choice of people was made randomly and the questionnaire was submitted individually to the respondents. One hundred

and fifty-four people regardless of gender, age and ethnicity agreed to participate in this survey (Tonjock, Nkengmo, Theobald Mue, Ache Neh, & Afui, 2017; Bakary, et al., 2019) .

Mushroom Identification

The identification of wild edible mushrooms was done in situ using identification keys (Fadeyi, et al., 2017; Yian, Pitta, & Tiebre, 2020) . The following characters were observed:

- Color, shape, size and appearance of the cap, blades and slats;
- Ornamentation and consistency of the cap and foot (presence of scales, cones, a ring, fibrils);
- Possible changes in color of the flesh exposed to the air;
- Mode of insertion of the blades in relation to the foot;
- Growth mode (solitary, in groups, in clumps, in flocks, forming witch's circles);
- Ecology (nearby trees, biotope, development on wood, in grass, on the ground or on a particular support).
- Consistency, color, smell and flavor of the flesh
- Presence of pseudorhiza
- Presence of the perforatorium….

Domestication of Wild Edible Mushrooms

Preparation of PDA Medium and Seeding of Mushrooms

The PDA medium was prepared and the different mushrooms collected were cleaned. Using a sterile spapel, the mushrooms were torn, a small piece of tissue was taken and introduced into the petri dishes containing approximately 12 ml of PDA medium and seale. The newly inoculated Petri dishes were incubated at room temperature for 8-12 days (Asseng, et al., 2017; Shahtahmasebi, et al., 2018; Pitta, Yian, Adjessi, & Tiebre, 2020). Data relating to growth rate were collected at a frequency of two days after appearance of the mycelium characteristic of the fungus.

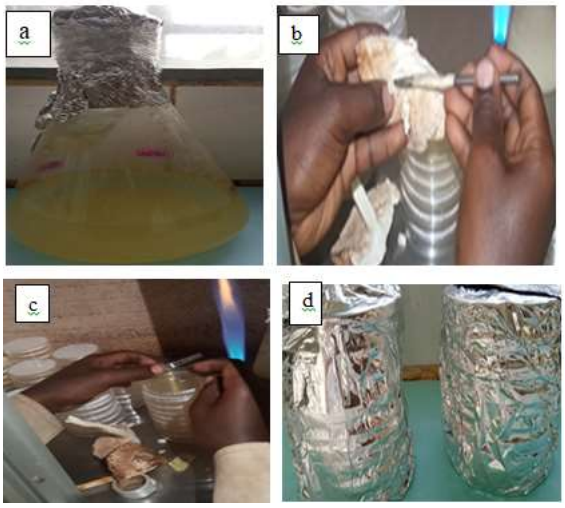

Figure 2 : Steps of mycelial culture a) PDA medium, b) Collection of a fragment of carpophores, c) Seeding d) Incubation of the seeded boxes.

Cultivation on Cereal

Cereal grains, particularly corn, were used as a seedling substrate due to availability. The corn kernels were soaked for 24 hours with slaked lime, cooked for 15 minutes. These seeds were allowed to cool then introduced into the glass jars. Then proceed to autoclave sterilization for 40 min. Allow to cool and inoculate with the mycelium obtained in mycelial culture under total aseptic conditions. The substrate was incubated in a cabinet to create darkness for total invasion; Incubation took place in a dark room because darkness favors rapid colonization of the substrate (Shahtahmasebi, et al., 2018) . The time relative to total invasion of the substrate was noted every 7 days. Data was collected every week

Fruiting Test of Harvested Mushrooms

The fruiting tests were carried out according to the methods of (Shahtahmasebi, et al., 2018; Pitta, Yian, Adjessi, & Tiebre, 2020; Nteziryayo, Tibuhwa, Kiyuku, Muvunyi, & Masharabu, 2019)

For the fruiting test, it was a question of setting up a randomized complete block experimental design with a two-factor factorial treatment. The blocking or stratification factor being the type of substrate (corn cob and sawdust). The treatment factors being the combination of the additive and the variety. Wheat bran and corn bran were our two additives. Five (5) repetitions were applied in the same block. There are a number of 60 experimental units (2 substrates x 2 additives x 3 varieties x 5 repetitions). With 03 blocks, the 60 experimental units were measured after 28 days of incubation (release) the first observations were noted. After invasion of the substrate, the conditions for fruiting were triggered through the thermal shock and the observation of the appearance of the first primordia was made over an interval of three days. Then the total weight of the carpophores collected by bale was evaluated for the different treatments.

Data Analysis

The data were analyzed and encoded using the Excel 2016 spreadsheet. Analyzes were carried out using SPSS Version 21 software. Statistical analyzes were carried out to verify significant differences between average weights and average growth rates. These are the one-way ANOVA test for normally distributed variables and the non-parametric Kruskall-Wallis and Mann-Whitney tests to compare the mean values of variables not following the normal distribution.

III. RESULTS

Socio-Demographic Characteristics of Respondents

For this study, 154 people were surveyed on their knowledge of edible mushrooms. The majority of these were men 65%. The ages of the respondents ranged from 6 to 74 years. The age group between]10 - 20] has the largest percentage of respondents (58%). The nature of acquisition of knowledge on

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the edibility of wild mushrooms is transmitted mainly by family members (68%) and 32% empirically. The highest percentage of respondents is found in the Mbouda district (44%) and the lowest in the Babadjou district.

Table 1: Socio-demographic characteristics of respondents

Characters	Frequency (%)
Gender	
Male	65
Female	35
Age	
]10 -20]	58
[21 -30]	25
[31 -40]	5
[41 -50]	7
>50	5
Nature of knowledge acquisition	
By family members	68
Empirical	32
Distribution by district	
Babadjou	14
Batcham	20
Galim	22
Mbouda	44

Table 2: Identification of wild mushroom

Comparison parameter	*Termitomyces letestui*	*Termitomyces Striatus*	*Termitomyces Auriantiacus*	*Termitomyces Brunneopileatus*
Hat color	Greyish, sometimes white	Brown, sometimes red	Brown, sometimes red	Black
Hat diameter size (in cm)	7.5 to 35	5 to 8	5 to 8	6 to 10
Plan form at mature stage	Convex	Convex	Convex	Convex
Flesh color	White	White	White	White
Foot length size (in cm)	10 to 30	10 to 15	10 to 18	10 to 18
Growth mode	In groups and sometimes near termite mounds	In Group	In groups and sometimes alone	In groups and sometimes alone
Presence of pseudorhiza	Yes	Yes	Yes	Yes
Presence of perforatorium	Yes	Yes	Yes	Yes
Blade size	0.4 to 0.8	0.1 to 0.2	0.6	0.2 to 0.3

Wild edible Mushrooms Identified in Situ

Harvested wild edible mushrooms have different characteristics in terms of color and size of the cap as well as the size of the stem tubes. The shape of the hats of most species is convex. These species grow in the ground near termite mounds, in groups and sometimes isolated. Four species of edible mushrooms have been identified.

Figure 4: Edible mushroom identified in situ a) Termitomyces letestui in situ ; b) after harvest (the arrow on the foot indicates the pseudorhiza and that on the head the perforatorium) ; c) Termitomyces striatus ; d) Termitomyces aurantiacus ; e) Termitomyces brunneopileatus ; f) after harvest (the arrow on the foot indicates the pseudorhiza and that on the head the perforatorium).

The different mushrooms collected in the Bamboutos Department belong to the Lyophyllaceae family and the Termitomyces genus. These are Termitomyces letestui (Tl), T. striatus (Ts), T. aurantiacus (Ta) and T. brunneopileatus (Tb). Termitomyces aurantiacus and Termitomyces lettestui are the two species that predominate in the districts of Mbouda, Galim and Babadjou. While in Batcham it is the species T. brunneopileatus which dominates.

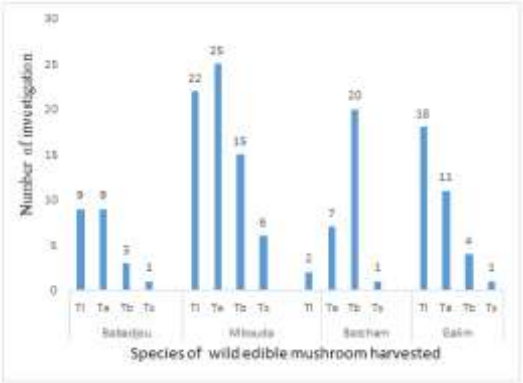

Figure 5: Distribution of mushroom species collected in the study area

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Termitomyces Domestication Test

Mycelial Culture

The growth rate of the 04 species of edible mushrooms in mycelial culture was noted over the course of 12 days. It appears that Termitomyces letestui (Tl), Termitomyces aurantiacus (Ta) and Termitomyces striatus (Ts) show rapid growth from the 2nd to the 6th day unlike Termitomyces brunneopileatus (Tb). From the 8th to the 12th day, all these species grow at the same speed which is constant, thus marking the time necessary for all these species to exhaust the stock of nutrients available in their culture medium.

Table 3: Annova mycelial culture alpha = 0.05

Anova table	SS	D.F.	NS	F	Capital gain
Treatment interval	1,383	3	0.4609	0.3248	P = 0.8074
Group processing	28.38	20	1,419		
Total	29.76	23			

NS: non-sinificative; DF: significant difference

Table 4: Tukey multiple comparison

Tukeys multiple comparison	Average	Capital gain	Significance
C1B1 VS C2B1	0.4000	0.9365	NS
C1B1 VS C3B1	0.3667	0.9500	NS
C1B2 VS C4B1	0.6750	0.7614	NS
C2B1 VS C3B1	0.0333	0.999	NS
C2B1 VS C4B2	0.2750	0.9778	NS
C3B1 VS C4B1	0.3083	0.9692	NS

NS: non-significant difference

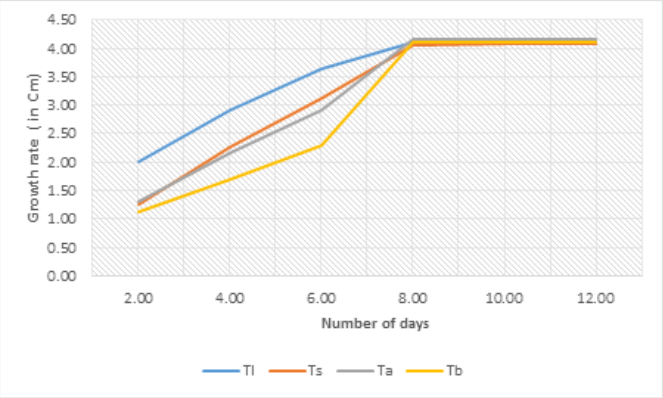


Figure 6: Growth speed of the four varieties of Termitomyces in mycelial culture

Cultivation on Cereal (Corn Grains)

The growth of these four varieties of edible mushrooms in culture on corn grains showed that the species Termitomyces letestui (Tl), Termitomyces aurantiacus (Ta) and Termitomyces brunneopileatus (Tb) have a rapid growth rate unlike Termitomyces striatus (Ts). These three varieties completely invade the substrate around the 6th week unlike the 2nd variety which does so from the 7th week. There is a significant difference between the growth rates of the four wild edible mushrooms.

Table 5: Annova cultivation on corn seeds

Anova table	SS	D.F.	NS	F	Capital gain
Treatment interval	1,059	3	0.3459	F(3.20) =0.24	0.862
Group processing	27.94	20	1,397		
Total	28.98	23			

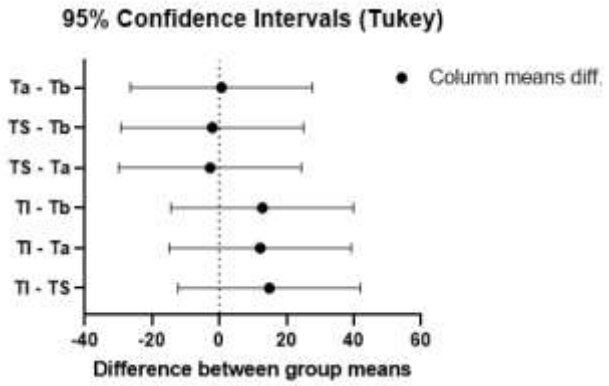


Figure 7: Multiple comparison of growth rate on corn kernels

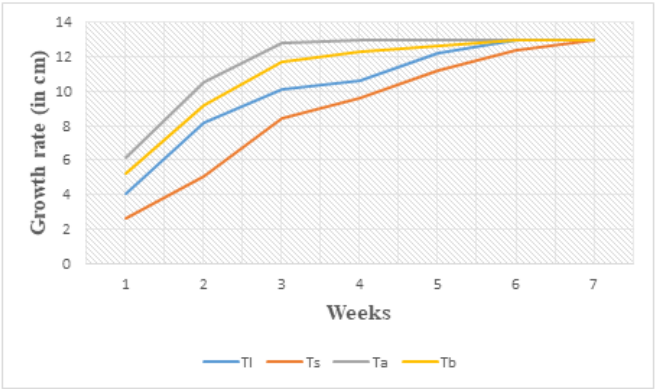


Figure 8: Growth of four varieties of mushrooms on cereal grains

Cultivation on Corncobs

The growth of the four (04) varieties of edible mushrooms grown under corn cobs shows that Termitomyces letestui (Tl) and Termitomyces aurantiacus (Ta) invade the substrate very quickly. While Termitomyces brunneopileatus (Tb) and Termitomyces striatus (Ts) present a slow rate of invasion of the substrate. The speed of invasion of the substrate is a

function of time. There is a significant difference in the speed of total invasion of the four varieties of wild edible mushrooms on corn cobs.

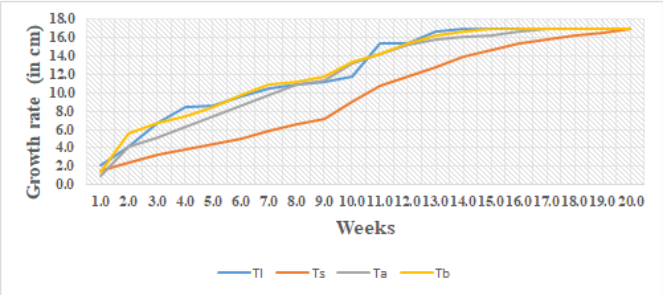


Figure 9: Growth speed of the four mushrooms on the stems of myïs

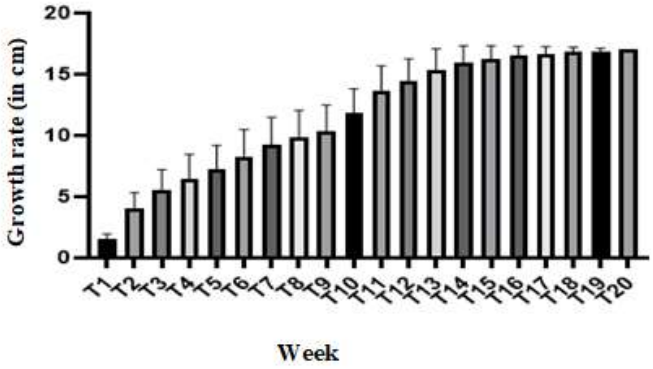


Figure 10: Significant differences in seed growth speed on corn cobs

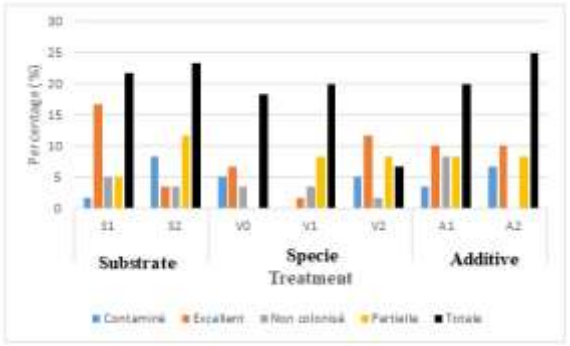
Fruiting Test

Assessment of the Level of Colonization

The assessment of the level of colonization was made after the end of the incubation phase. The results show that the first substrate consisting of corn husk presents a better percentage of excellent colonization (16.67%) unlike the second substrate consisting of sawdust (3.33%).

The bales containing corn husks were the least contaminated (1.67%). On the other hand, those containing sawdust were more contaminated (8.33%). Termitomyces auriantiacus (v2) presents a better percentage of colonization (11.7%) followed by oyster mushrooms ostreatus (6.67%) and finally Termitomyces letestui (v1) 1.67%.

5% of bales seeded with Termitomyces auriantiacus (v2) are contaminated. On the other hand, the one containing Termitomyces letestui (v1) does not record any contamination. In terms of additives, the two additives have the same percentages of the colonization level.



S1: Corn cobs; S2: Sawdust; A1: Corn bran; A2: Wheat bran;

V0: Oyster mushroom ostreatus; V1: Termitomyces letestui; V2: Termitomyces auriantiacus

Figure 11: Comparative assessment of the level of colonization depending on the type of substrate, varieties and different additives.

Table 6: Statistical Z test of the level of colonization of varieties between blocks

Categories	Variables	Blocks (substrates)		Total
		Substrate 1	Substrate 2	
Varieties	Witness	10a	10a	20
	Variety 1	10a	10a	20
	Variety 2	10a	10a	20
Total		30	30	60

Table 7: Statistical Z test of additive colonization level between blocks

Categories	Variables	Blocks (substrates)		Total
		Substrate 1	Substrate 2	
Additive	Addendum 1	15a	15a	30
	Addendum 2	15a	15a	30
Total		30	30	60

Table 8: Statistical Z test for assessing the level of colonization between blocks

Category	Variables	Blocks (substrates)		Total
		Substrate 1	Substrate 2	
Colonization level	Not colonized	3a	2a	5
	Contaminated	1a	5a	6
	Partial	3a	7a	10
	Total	13a	14a	27
	Excellent	10a	2b	12
Total		30	30	60

Evaluation of the Weight of Mushrooms at Harvest

The control variety (Pleurotus ostreatus) has a better yield of carpophores. The fruiting bodies obtained following the cultivation of wild edible mushrooms are undifferentiated. The substrate consisting of corn cobs + wheat bran presents a better yield on all three varieties (221.66±3.36 g; 89.24±3.74 g and 93.58±7.13g) namely oyster mushrooms ostreatus, Termitomyces letestui and Termitomyces aurantiacus respectively according to fresh weight.

Table 9: average weight of mushrooms harvested

Experimental unit	Average weight of carpophores (g)
S1V0A1	221.66±3.36a
S1V0A2	190.46±2.15a
S2V0A1	125.75±5.78a
S2V0A2	102.48±4.76a
S1V1A1	89.24±3.74b
S1V1A2	75.96±0.20b
S2V1A1	70.25±9.98b
S2V1A2	69.1±4.03b
S1V2A1	93.58±7.13b
S1V2A2	80.2±8.95b
S2V2A1	65.3±6.05b
S2V2A2	55.1±9.45b

S1: Corn cobs; S2: Sawdust; A1: Wheat bran; A2: Corn bran
SiVjAk: ith Substrate of the jth Variety of the kth Additive.
V0: Oyster mushroom ostreatus; Vl: Termitomyces letestui ; V2: Termitomyces auriantiacus

Figure 12: Mushrooms collected after the fruiting test a) oyster mushrooms; b) the Termitomyces does not present the characteristics of those collected at the study site

IV. DISCUSSION

This study on wild edible mushrooms, carried out in the Bamboutos department of the West Cameroon region, indicates that the level of knowledge of wild edible mushrooms varies from one locality to another. The transmission of knowledge related to the edibility of wild mushrooms is mainly transmitted by family members. This is explained by the fact that in several regions of Cameroon, Africa and the world, parents and elders manage to pass on knowledge to children or younger people on the edibility of mushrooms from their respective regions (Njouonkou, et al., 2016; Tonjock, Nkengmo, Theobald Mue, Ache Neh, & Afui, 2017; Teke, et al., 2018). In fact, it is common in most regions, particularly tropical Africa, and could be explained by the loss of certain traditions due to rural exodus and change in lifestyle. During our discussions with community members, it was observed that about 65% of the knowledge regarding mushroom collection was provided by men, while women contributed about 35%. This disparity may reflect traditional gender roles within the community, where men often engage, in foraging activities, while women can concentrate on the preparation and use of the harvested mushrooms. This finding aligns with previous studies that highlight the gendered nature of resource collection in rural communities, highlighting the need for inclusive approaches that recognize the contributions of both men and women in the sustainable management of mushroom resources (Fadeyi, et al., 2017; Nikuze & Nzigidahera, 2020). It therefore appears that 93% of those surveyed in this work were men. However, it has been shown in several studies that mushroom picking is considered work for women and children especially the Termitomyces species which are popular and easily consumed after cooking (Onguene & Kuyper, 2019; Kamou, et al., 2017).The age groups between] 10 -20] and [20 -30] presented the largest number of respondents, young people are more adept in the activities of picking edible mushrooms. This is due to the fact that the latter have enough strength and resistance to travel long distances in order to harvest mushrooms which will be sold in order to increase the family economy. This is in agreement with the work of (Yian, Pitta, & Tiebre, 2020) therefore the majority represented age group between]10 - 40] had the largest number of surveys. Young people could be more willing to learn more about mushroom collecting and their ecological importance, which could contribute to the conservation of macrofungi.

The wild edible mushrooms revealed during the survey period are all symbiotic and belong to the Lyophyllaceae family and only the Termitomyces genus. These are: Termitomyces letestui, Termitomyces striatus, Termitomyces aurantiacus, and Termitomyces brunneopileatus. In our work we found only 4 species of Termitomyces, we were expected to see more diversity given by ecological conditions. It should be noted that the majority of species of mushrooms that grow in the western region of Cameroon during the month of March to May are Termitomyces (Mossebo, Essouman, Machouart, & Gueidan, 2017; Pitta, Yian, Adjessi, & Tiebre, 2020). However, 10 species of Termitomyces have been identified in Bamoun (Njouonkou, et al., 2016), 22 species in humid forest of Cameroon (Onguene & Kuyper, 2019), 2 in Northwest region of Cameroon (Tonjock, Nkengmo, Theobald Mue, Ache Neh, & Afui, 2017; Teke, et al., 2018), 3 species in the mountain region - Kouffe in Benin (Fadeyi, et al., 2017), 4 species in humid forest of South Cameroon (Onguene Awana,

Tchudjo Tchuente, & Kuper, 2018) . There is a significant difference in the microbiota between our locations. It could be due to various factors like habitat differences, soil composition, moisture levels, local agricultural practices or even the time of year we conducted our research.

The domestication of Termitomyces species presents a unique opportunity to explore the cultivation of mushrooms that are not only culturally significant but also ecologically important due to their symbiotic relationship with termites. Domestication was carried out in two stages, seed production and fruiting tests. The seed production process was a total success. All the petri dishes were completely invaded by the culture medium after 8 days of incubation. This rapid colonization indicates a robust mycelial growth, which is crucial for the subsequent stages of mushroom cultivation. The findings suggest that the tissue culture method employed was effective in isolating and propagating the mycelium of the selected mushroom species. The 8 day incubation period aligns with previous studies that have reported similar or shorter colonization times for various mushroom species, indicating that the conditions provided (such as temperature, humidity, and nutrient availability) were optimal for mycelial growth (Nteziryayo, Tibuhwa, Kiyuku, Muvunyi, & Masharabu, 2019; Yian, Pitta, & Tiebre, 2020). The four species of Termitomyces completely invaded cereal seeds and corn cobs with different growth rates. Termitomyces letestui and aurantiacus have the best growth rates on cereal seeds and corn cobs. When growing on cereals, the species presenting the best growth rates completely invaded the substrate after 6 weeks of incubation, whereas the corn cobs invaded after 15 to 17 weeks for the species with the best growth rates. These results suggest that the nutritional composition and physical structure of cereal seeds may provide a more conducive environment for mycelial growth than corn cobs. This observation is consistent with previous studies that have highlighted the importance of substrate selection in mushroom cultivation, as different substrates can offer different levels of essential nutrients and moisture retention. The prolonged incubation period observed for corn cobs can also be attributed to environmental parameters such as temperature and humidity. These factors are essential to growing mushrooms because they can significantly impact mycelium growth rates. The longer colonization time of corn cobs suggests that this substrate may require more precise environmental control to optimize growing conditions. This may also indicate that structural characteristics of corn cobs, such as their density and moisture content, could hinder rapid colonization. The successful production of seeds is a critical milestone in the domestication and cultivation of mushroom (Hussein, Tibuhwa, Mshandete, & Kivaisi, 2016; Orikoha & Dimkpa, 2021; Shahtahmasebi, et al., 2018) .The domestication of Termitomyces species has garnered significant interest due to their ecological importance and culinary value. However, challenges remain in achieving consistent fruiting body differentiation during cultivation. We observed the formation of undifferentiated fruiting bodies during the cultivation process. The presence of undifferentiated fruiting bodies suggests that while the mycelium is capable of growth and colonization, the environmental conditions or nutritional substrates may not yet be optimized for full fruiting body differentiation. This phenomenon aligns with previous findings that indicate Termitomyces species are particularly challenging to cultivate due to their complex life cycle and dependency on specific ecological interactions with termites (Kabacia & Muchane, 2023; Nteziryayo, Tibuhwa, Kiyuku, Muvunyi, & Masharabu, 2019).

V. CONCLUSION

The study demonstrated the possibility of domestication of Termitomyces. At present, oyster mushroom is still the most and only specie cultivated in Cameroon. It appears that four species of wild edible mushroom were collected during the ethnomycological inventory. The in situ identification of wild edible mushrooms growing in the Bamboutos department shows that they are Termitomyces letestui, Termitomyces striatus, Termitomyces aurantiacus and Termitomyces brunneopileatus. All symbiotic and all belonging to the Lyophyllaceae family and the Termitomyces genus. The seed production process for different species of Termiomyces was a complete success. However, the mushrooms harvested from the control lots (pleurotus ostreatus) were identical to those commonly cultivated. Furthermore, the carpophores collected from the Termitomyces were undifferentiated and not identical to those collected at the study site.

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