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Contribution to the Knowledge of Fungal Biodiversity in Senegal by a Study of Basidiomycete Species of the Order of Agaricales in the Dakar Region

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Agaricales is one of the most diverse orders of Basidiomycete leaf mushrooms. Most species of this order are of great scientific interest and economic interest. Despite this huge diversity, Agaricales and mushrooms, in general, have been the subject of very few studies in Senegal. This study was undertaken to contribute to a better knowledge of fungal biodiversity in Senegal, particularly Basidiomycetes species of the order of Agaricales in the Dakar region. For this, observations were carried out in four sites namely; the Botanical Gardens of the Faculty of Science, the Botanical Gardens of the Faculty of Medicine, the Mbao Classified Forest and the Hann Forest Park. The description and identification of the samples were made based on both the macroscopic and ecological characteristics of the harvested mushrooms. This work enabled to make an inventory of seven species of Agaricales from which three were identified. Among the 4 unidentified species,

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some could probably be new species. All of these inventoried species belong to three genera (*Agaricus*, *Leucoagaricus* and *Leucocoprinus*) and two families (Agaricaceae and Lepiotaceae). This preliminary work also permitted to elaborate keys of the determination of harvested species, and a basic list of mushrooms belonging to the order of Agaricales.

Keywords: Biodiversity; Basidiomycetes; Agaricales; Dakar; Senegal.

1. INTRODUCTION

In the strict sense the Agaricales constitute one of the most diversified orders of Basidiomycetes mushrooms. This order includes several families that present a significant economic subject because of their use as drugs, and as food. Edible fungi are mostly found in the family of Agaricaceae especially in the genera or genus of *Agaricus* [1]. In Africa, the scientific knowledge about Agaricales was almost confined to the species treated in the iconographic flora of Congo fungi by Heinemann [2], in the illustrated flora of Central African mushrooms [3] and in the preliminary agaric flora of East Africa [4]. However, a more recent study was carried out on thirteen species of Basidiomycetes fungi belonging to the genus *Agaricus* in the Mamora forest in Morocco [5]. These latter harvested seven species of Basidiomycetes belonging to the Coprinaceae family as part of a study of some coprines from the Mamora forest. In Senegal, studies on Agaricales are rare and have mainly focused on the molecular phylogeny of the fungi of the genus *Termitomyces* (belonging to Agaricales in the broad sense, whose study does not interest us directly in this work) on the basis of the ITS region [6]. A systematic study of three families (Lepiotaceae, Coprinaceae and Agaricaceae) of the mushroom fungi harvested on the Cape Verde peninsula was also conducted by Kane [7]. The difficulty in determining superior fungi (Basidiomycetes carpophore) is largely due to their polymorphism. Indeed, the same fungus may appear in different aspects depending on climatic conditions and its age [8]. In addition, different species may look alike at first, and be different only by details (macroscopic or microscopic) which are not immediately perceptible [9]. Thus, this present work proposes to study the diversity of basidiomycete species of the order Agaricales (in the strict sense) in the region of Dakar. Therefore, the study covers the following specific objectives: i) to make an inventory of the species in the different sites prospected ii) to describe samples obtained from macroscopic and ecological characters iii) to develop the

determination keyso facilitate species identification, and iii) to develop a basic list of mushrooms belonging to the order of Agaricales.

2. METHODOLOGY

2.1 Description of the Study Sites

2.1.1 The Mbao classified forest

The Mbao classified forest makes at least 700 hectares of wood wedged between Mbao district communes, Diamaguène-Sicap Mbao and Keur Massar [10]. It is the subject of several attacks from property developers and local residents since this site is considered as a green lung in the capital without mentioning the incessant cuts of wood, garbage dumps and other threats. Today, its future is compromised. According to [10], this site is a specialised perimeter in the production of cabbages and onions. However other speculations are cultivated as pepper, mint, aubergine, strawberry and salad. Fruit trees are not diversified, with only producing papayas and mango trees in the gestation or making.

2.1.2 The Hann forest park

The park was created in 1903 by Governor Martial Merlin. It covers about 60 hectares [11], and includes the classified forest and a classic zoo. This site a place of relaxation and discovery in the heart of the capital, but the maintenance leaves something to be desired, despite a large number of visitors. The Garden of Hann, admirably placed at the gates of Dakar, therefore deserves to be refurbished. Among the attractions of the Forest Park, there is the ethnobotanical square that has been built since 1934. The ethnobotanical garden contains plant species of various origins. In order to better respond to its dual scientific and technical vocation (research and studies concerning botany), efforts have been made in the introduction and acclimatisation of exotic species as well as the classification, identification and the production of local species. Several species have been introduced and distributed in different

sectors on the basis of a classification. Thus, aquatic species, condiment species, industrial species, perfume species, medicinal species, gathering species, protected species, fruit species, vegetable species and decorative species are noted. All these species are identified and labelled with explanatory panels.

2.1.3 The botanical garden of the faculty of science

Created in 1961 by Professor J. MIEGE, the Botanical Garden of the Faculty of Science and Technology of UCAD has an area of 3 ha. Originally, the botanical garden was considered as a test garden of introduced plant cultivation, experimentation and botanical research for researchers of the Department of Plant Biology. Currently, it is the main introductory course in botany for students in the Bachelor of Natural Sciences and Training Schools. It is one of the few sites of natural greenery in Dakar with accelerated urbanisation. The garden is divided into six sectors: the medicinal plant sector, the food plants sector, the sector of artisanal and industrial plants, the plant sector of Senegal's flora, the sector of conservation of the rare or threatened plants of the Senegalese flora and the area of the arboretum. For each sector, a list of plants has been proposed.

2.1.4 The botanical garden of the faculty of medicine

This Experimental Plant Experimentation Garden (JEPU) of the Laboratory of Pharmacognosy and Botany (UCAD / Faculty of Medicine and Pharmacy) was created in 1986 and covers an area of approximately 1.9 ha. It is intended for the teaching of applied botany (useful plants), the multiplication and production of seeds, but also for research. The activities of the garden are concentrated around the cultivation and presentation of useful species from West Africa, on the conservation of these species, as well as on the multiplication and production of seedlings for reforestation operations (approximately 400 species).

2.2 Research Approach

The basic material used to collect mushroom samples included a basket to carry the samples collected, a knife to dig up the mushrooms with care while avoiding the maximum of cutting the

foot whose base is an essential element of determination, a notepad and a pencil to record all the essential elements in the field, a double decimetre to measure the size of mushrooms and a camera to photograph the mushroom in situ. Indeed, mushrooms have very fleeting morphological characters that can quickly disappear just after harvest. The biological material consisted of samples observed and harvested in the field. The sample was placed on newspaper, numbered and labelled with certain indications such as the name of the harvester, the date of harvest and the precise location of harvest. The samples were carefully stored in the basket and shipped home where they were dried under the sun during two days for the fleshiest mushrooms and in a day for the moderately fleshy. The tough or brittle samples can be directly dried in the open air to avoid their destruction. The harvest is carried out in August and September (2010), periods which are favourable to fungal growth in Senegal. In fact, we needed a soil moistened by the night rains or the strong morning dew and a very sunny day for the mushroom to tip the tip of his hat. A mushroom with carpophore, in its entirety, is constituted of the carpophore and the mycelium that remains underground to regenerate other possible spores. The identification was done in the following steps: a description of the macroscopic characters, a description of the ecological characteristics and development of determination keys. The description of the macroscopic characters requires a rigorous and detailed visual examination of the mushroom from every angle. It is based on a set of characters from different parts of the mushroom. The ecological characteristics are based on: the habitat of the fungus that can grow under a tree, on a dead or living tree trunk or on wood, or on the ground; the characteristics of the soil that can be covered with litter or not, bare or covered with plants; the degree of sunshine; and the humidity of the environment such as moist soil, very humid, dry, or very dry. The development of determination keys is based on the summary analysis of tables reflecting the characteristics of the harvested species and on the consultation of other keys of the main groups of mushrooms. It is on the basis of all the information from the macroscopic observations, the ecological characteristics and the development of keys of determinations that one can carry out a research of the name of the concerned species while working on an appropriate literature.

3. RESULTS AND DISCUSSION

3.1 Description of the Species

The harvested species and the numbers of the samples and the studied species with systematic position are recorded in the following tables. The specimens were preserved in herbarium called Dakar Herbarium at the Faculty of Sciences, Department of Plant Biology.

3.2 Description of the Species of the Agaricaceae Family

3.2.1 The genus of *Agaricus*

In this genus 4 species were harvested.

Agaricus cf volvatulus Heinem. (Photo 1)

i) Macroscopic description

The hat, reaching up to 7 cm in diameter, has a tomentose surface with a white but brownish colour in the middle, a flattened shape with a depression at the center which is thick, then thin towards the margin which is fissured. The hymenophore presents fairly regular uneven blades, of brown-black colour. The stipe is cylindrical and central, sufficiently thick, measuring 5 cm of length, with fibrous ornamentation, white in colour, yellowing strongly to crumpling, with a white mycelial tissue at the base which is suddenly bulbous. The ring is ascending, fixed and fibrous, located at the top of the foot, very fragile and with more or less visible remains in the photo. The flesh is firm in the hat, fibrous in the foot, white, becoming brownish-pink at the cut, with no smell.

ii) Ecology

This solitary mushroom is harvested at the Hann Zoological Park on moist soil covered with litter and whitish mycelium in an area of strong luminosity.

iii) Discussion

The descriptions provided by Heinemann [2] agree strongly with our observations. However, for the tufted conifers, the tomentose character of the more pronounced coating and the sliding ring constitute the main differences with the description of De Kessel et al. [12] in Benin. This fungus is also known in Congo [2] where it is consumed and very or well appreciated [13]. Its neighbor, *A. campestris* (L. Fr.), described by

Polèse and Deconchat [14], presents the same shape of the hat, the same colour of the blades and the fragile ring, but is distinguished by the thinning of the base of the foot and the blushing appearance of the flesh in the open air.



Plate 1. *Agaricus cf volvatulus* Heinem

Agaricus sp.1 (Photo 2)

i) Macroscopic description

The hat or cap, measuring 2.5 cm in diameter; is smooth, hemispherical and hilly, cream-white, with a yellow spot in the center and with a ridged gutter or margin. The hymenophore exhibits blades and lamellules, subspecies tinged with a pale gray, then a brown-black, with irregular ridge. The stipe is white, cylindrical and central, slender and fluffy, bulbous base, and measures 4.5 cm long. The ring is descending and full, fluffy below, the same colour as the hat, then becoming yellowish too. The flesh is silky, firm and thick, and gives a fine and pleasant smell.

Table 1. List of harvested species including date and place of harvest, sample number and harvest name

Species	Harvest date	Harvest location	Sample Name / No of the harvester
<i>Agaricus volvatulus</i>	19/09/2010	Hann Zoological Park	KN15/Khady Ngom
<i>Agaricus sp1</i>	19/09/2010	Hann Zoological Park	KN18/Khady Ngom
<i>Agaricus sp2</i>	24/09/2010	Mbao Classic Forest	KN32/Khady Ngom
<i>Agaricus sp3</i>	24/09/2010	Mbao Classic Forest	KN35/Khady Ngom
<i>Micropsalliota sp1</i>	21/08/2010	Botanical Garden of the Faculty of Sciences	KN5/Khady Ngom
<i>Micropsalliota sp2</i>	20/09/2010	Jardin Botanique de la Faculté des Médecines	KN22/Khady Ngom
<i>Lepiota sp1</i>	20/08/2010	Botanical Garden of the Faculty of Sciences	KN3/Khady Ngom
<i>Lepiota sp2</i>	10/09/2010	Botanical Garden of the Faculty of Medicine	KN12/Khady Ngom
<i>Leucoagaricus bresadolae</i>	22/09/2010	Hann Zoological Park	KN29/Khady Ngom
<i>Leucoagaricus sp</i>	22/09/2010	Hann Zoological Park	KN24/Khady Ngom
<i>Leucocoprinus denudatus</i>	22/09/2010	Hann Zoological Park	KN26/Khady Ngom
<i>Leucocoprinus sp</i>	03/09/2010	Mbao Classic Forest	NK9/Khady Ngom

Table 2. List of studied/described species with an indication of their systematic position

Class	Subclass	Order	Family	Genera	Species
Holobasidiomycetes	Agaricomycetidae	Agaricales	Agaricaceae	<i>Agaricus</i>	<i>A. volvatulus</i>
					<i>A. sp1</i>
					<i>A. sp2</i>
					<i>A. sp3</i>
				<i>Leucoagaricus</i>	<i>L. bresadolae</i>
				<i>Leucocoprinus</i>	<i>L. denudatus</i>
				<i>L. sp</i>	

ii) Ecology

The sample is harvested at the Hann Zoological Park on bare soil with no apparent litter, with average humidity. The soil is clayey and has a blackish colour.



Plate 2. Agaricus sp.1

iii) Discussion

This species is well characterised by the shape of its hat as well as the change of its colour, the inequality of its blades, but also its pleasant smell. This species is similar to *A. arvensis* also called Agaric fallow, described by Lamaison and Polèse [15], but is distinguished by its strong smell sufficiently pronounced and its ring whose base forms a kind of gear wheel. The present species also has characters close to those of *A. silvicola* commonly known as Agaric of wood or Rosy of wood [16], but the only difference is in the browning aspect of its cuticle as it ages. The present specimen is very similar to deadly amanita, especially the phalloid amanita in its white forms. As a reminder, these amanites also have a volva at the base of the foot and immutably white blades that differentiate them from the collected sample.

Agaricus sp.2 (Photo 3)

i) Macroscopic description

The convex hat or cap, measuring 3 cm in diameter, has a white background covered with greyish-brown scales widening towards the margin or gutter which is striated. The hymenophore presents uneven and tight blades with a dark brown colour and with regular ridge. The stipe is central, cylindrical and weakly fluted, measuring 3.5 cm of length, reddish-brown in colour, and becoming darker towards the bulbous base. The ring is in the form of a trace, with the same colour as the foot, located towards the upper part of it. The flesh, browning as aging, has a very strong smell.

ii) Ecology

This species is harvested from the Mbao Classified Forest on a fairly dry, low-leafy soil in a sunny location.



Plate 3. Agaricus sp.2

iii) Discussion

The brown flesh with a very strong odor, as well as the hat covered with brown scales more concentric in the center, are the main characteristics of this species. This specimen has affinities with *A. silvaticus* Schaeffer, described by Houdou [16], which differs in its tender flesh, blushing at the cup and a machete hat. *A. variegans* Moller, described by Polèse and Deconchat [14], presents the same profile from a distance, but is distinguished by the dirty brown colour of the scales of his hat arranged concentrically and the size of its foot which is equal to the diameter of the hat.

Agaricus sp. 3 (Photo 4)

i) Macroscopic description

The hat or cap is convex and squamous, measuring 2 cm in diameter, with a white background with a brown spot in the center, cracks towards the margin which is more or less coiled. The cuticle covered with fine locks, leaves yellow spots to the touch. The hymenophore is composed of tight blades and lamellules tightened, with regular ridge, pale pink at the beginning before becoming tinged with a very dark brown. The slightly crenellated ring, the same colour as the hat, disappears quickly after rupture of the veil. The foot is thin, slightly fluffy under the hat, but smooth below the ring and yellowing to aging. It has a central cylindrical shape with a bulbous base and measures 2.5 cm of length. The firm flesh, yellowing to aging, has a fruity odor.

ii) Ecology

This species is harvested in the Mbao Classified Forest in a bushy area with abundant litter. Individuals grow in groups of two, quite common in places.



Plate 4. Agaricus sp.3

iii) Discussion

The firm flesh, yellowing to aging especially at the foot, and the fruity smell, are the most obvious features to avoid confusion with neighboring *Agaricus*. Proper edible but sometimes heavy to digest, this *A. arvensis* Schaeffer described by Polèse and Deconchat [14], is the look-alike of our specimen by the yellowing of its aging flesh and its fruity smell but

is distinguished by its solid ring and double, the upper part of which is membranous while the lower part is covered with large scales forming a cogwheel. *A. campestris*, described by Houdou [16], presents the same profile except that it gives a fungal-fruity odor, a short and stocky foot, but also the browning appearance of aging flesh is one of its most distinctive characters.

Thus, in this genus 4 species are harvested but only one is identified (*Agaricus-cf-volvatulus*). The other 3 do not correspond to any macroscopic description of the global key to Agaricaceae [17]. Following this descriptive study, the characters of these species are listed in the following synoptic table.

This table indicates that with the exception of the colour of the hat which is white, the shape of the base of the foot which is bulbous and the insertion of the foot and blades which is central and unequal, all other characters are different among the 4 species of *Agaricus*. Among the latter, *A. sp.3* and *A. sp.2* both have a dark brown, but recognisable, hymenophore from the surface of the hat which is squamous in *A. sp.*, scaly in *A. sp.2* and appearance of yellowing flesh in *A. sp. 3* and brown in *A. sp.2*. The other 2 species are distinguished mainly by the stipe surface and the shape of the hat and the ring. The stipe is fibrous in *A. volvatulus* and fluffy in *A. sp.1* with hemispherical hat or cap, which is distinguished by the shape of the ring which is descending for this species and rather ascending for *A. volvatulus* with flattened hat or cap.

3.2.2 Key of the determination of Agaricaceae species

- 1. a- Hymenophore with dark brown blades (2)
- 1. b- Hymenophore with black blades (3)
- 2. a- Hat with squamous surface and yellowing flesh aging.....*Agaricus sp.3*
- 2. b- Hat with a scaly surface and aging brown flesh*Agaricus sp.2*
- 3. a-Stipe with a flaky surface; with hemispherical cap and descending ring.....*Agaricus sp.1*
- 3. b-Stipe with a fibrous surface; with flattened hat and ascending ring.....*Agaricus volvatulus*

Table 3. Main characteristics of Agaricaceae species

Characters		<i>Agaricus cf volvatulus</i>	<i>Agaricus sp.1</i>	<i>Agaricus sp.2</i>	<i>Agaricus sp.3</i>
Hat	Colour	White	White	White	White
	Form	Flattened and depressed in the middle	Hemispheric and mammillated	Convex	Convex
Stipe	Area	Tomenteuse	Smooth	Scaly	Squamuleuse
	Insertion	Power plant	Power plant	Power plant	Power plant
	Form of the base	Bulbous	bulbilleuse	bulbilleuse	Bulbilleuse
	Area	Fibrous	Flaky	Slightly fluted	Smooth
Hymenophore	Colour	Black	Brown black	Dark brown	Dark brown
	Inserting and spacing the blades	Uneven and quite tight	Uneven and sub-spaced	Unequal and tight	Unequal and tight
Flesh	Blades edge	Regular	Irregular	regular	Regular
	Consistency and aspect	Firm and browning	Farm and thick	Browning	Firm and yellowing
Ring	Odour	Nothing	Pleasant	Very strong	Fruity
		Ascending	Descending	Fleeting	Fleeting

Table 4. Main Characteristics of Lepiotaceae Species

Characters		<i>Leucocoprinus cf denudatus</i>	<i>Leucocoprinus sp.</i>	<i>Leucoagaricus Bresadolae</i>
Hat	Colour	White	White	White
	Form	Conical	Plane	Hemispheric
	Area	Streaked	Veined	Squamuleuse
Stipe	Insertion	Power plant	Power plant	Power plant
	Form of the base	Bulbous	Bulbous	Curved
Hymenophore	Area	Smooth with a veil	Smooth with a veil	Fibrous with a ring
	Colour	White	White	White
Flesh	Inserting and spacing the blades	Unequal and tight	Simple and wide	Unequal and tight
	Blades edge	Smooth	Fluted	Smooth
	Consistency	Fine, whitish in the hat and yellowish in the foot	Thick, whitish in the hat and yellowish in the foot	Thick, whitish throughout the carpophore and reddish-cut
Ring	Odour	Pleasant	Pleasant	Low
		White, thin and fleeting	White, membranous and sliding	Ascendant and membranous, fixed and fleeting

3.3 Description of the Species of the Lepiotaceae Family

3.3.1 The genus *Leucoagaricus*

Leucoagaricus cf bresadolae (Schulzer) Bon (Photo 5)

In this genus, two specimens are harvested, and the only one identified corresponds to the description of *Leucoagaricus cf. bresadolae*.



Plate 5. *Leucoagaricus bresadolae*

i) Macroscopic description

The white Hat, hemispherical cracked nipple, measuring 4.5 cm in diameter; is covered with brownish-reddish squamules more concentrated towards the center, with a subliminal margin but fissured by place. The hymenophore consists of tight, white-creamy blades and lamellules with regular ridges. The ring at mid-height is ascending and membranous, fixed and thick. The

white stipe, measuring 5.5 cm of length, centrally inserted and fibrillated; has a curved, torn and reddish base. The flesh is thick and firm at the level of the hat, fibrous in the foot, whitish throughout the carpophore, turning yellow or saffron at the cut before turning red; gives a weak smell.

ii) Ecology

This mushroom, represented by a single individual, is harvested at the Hann Zoological Park on a soil that is not visible because of the abundant litter, in a zone of medium brightness.

iii) Discussion

The macroscopic characteristics of our sample correspond entirely to those of *L. bresadolae*, described by Bon [18]. The harvest of De Kessel et al. [12] in Benin, differs from ours by the striation of the hat, the speed of senescence and putrefaction, and the relative thinness of the flesh of the hat, which are characters close to the genus *Leucocoprinus*. *L. bresadolae* is well known, harvested and consumed in Benin by people working in wood and sawdust deposits, [12], while its neighbor *L. badhamii* is known to be toxic and can cause more or less severe poisonings [19].

3.3.2 The genus *Leucocoprinus*

In this genus two specimens were harvested and described.

Leucocoprinus cf denudatus (Rabenh.) Singer 1951 (Photo 6)

i) Macroscopic description

The cap or hat, measuring 2 cm in diameter; has a conical, creamy-white, radially striated shape, with a yellowish and powdery nipple, and with a ridged margin. The hymenophore consists of blades and lamellules distant from the foot, moderately tightened, with white colour, and with smooth edge. The thin and slender stipe, flexuous at the central insertion, measures 4 cm of length, bulbous in base with leftovers of whitish mycelium. It is provided with a fleecy partial veil, persistent at the base and under the hat, leaving a smooth, yellowish flesh. The thin, whitish ring is located at the top of the foot and disappears rapidly. The flesh is fine and whitish in the hat but yellowish in the foot, and gives a pleasant odor.

ii) Ecology

This fungus with tufted mushrooms growing in clusters of three to six specimens, is harvested at the Hann Zoological Park on a black soil, moist, rich in humus and leafy, in a dark and full of herbaceous.



Plate 6. *Leucocoprinus cf denudatus*

iii) Discussion

The macroscopic descriptions of [20] agree much with those of our harvest. In Morocco, [5], collected in the Mamora forest a *L. denudatus* which differs only from our harvest by the yellowing aspect of its blades. It is closely related to its neighbour *L. cretatus* (Loquin) Moser harvested by De Kessel et al. [12], in Benin but is distinguished by the brownish colouring of the nipple and the fluffy ornamentation of the hat and of the foot. *L. denudatus* is without edible interest while *L. cretatus* is tasty and well appreciated in South Africa according to Levin [21].

***Leucocoprinus sp* (Photo 7)**

i) Macroscopic description

The flat Hat, measuring 6 cm in diameter; has a smooth, powdery, white surface with an uncoloured nipple, and with a margin fluted and

torn by heavy rain. The hymenophore has white, simple and broad blades with fluted ridge. The stipe with central insertion is smooth and flexuous, measuring 8 cm of length, and provided with a membranous and powdery partial veil up to the base which is bulbous. The ring is in the form of a ring, membranous, white in colour and sliding. The flesh is thick, powdery and white in the hat but yellowish in the foot, and gives a pleasant smell.

ii) Ecology

Individuals grow on a blackish soil, sandwiched between a wall and a Zinc carcass, in a moderately lit area. The mushroom is harvested at the Mbao Classified Forest during the periods of heavy rain, causing the tear of the gutters or margins of its hat.



Plate 7. *Leucocoprinus sp*

iii) Discussion

The species is well characterised by its large size, its white hat, and its widened and fluted blades, its long yellowish and bulbous foot provided with a membranous veil. It may be reminiscent of a small lepicon named

Leucocoprinus violaceus (Heinemann) harvested in Senega [7], but smaller in size and with a gray-purple hat in the center. *L. cretatus* (Loquin) [22] of comparable size, is getting closer but his blades are tighter and his hat is rather flaky. Our specimen may also be reminiscent of *L. birnbaumii* (corda) Singer in the field, as this species has a similar size, but the yellowish colour and the muscular cap of the latter allow to distinguish it unequivocally.

Thus, in this genus two specimens are harvested and described but only one is identified, it is the *L. cf denudatus*. Following this descriptive study, the characters of these species are listed in the following synoptic table.

The analysis of this table shows that the different species of Lepiotaceae have all a smooth stipe, provided with a partial sliding or fixed veil, bulbous base; with the exception of *L. bresadolae* which has a fibrous surface with an ascending and fixed ring with a curved base. The species *Leucocoprinus* have homogeneous characters including the colour of the flesh which is whitish in the hat and yellowish in the foot, pleasant smell. On the other hand, the two species are distinguished by the shape and the surface of the hat which is conical striated for the *L. denudatus*; plan and veined in *L. sp.* The hymenophore shows uneven, tight, smooth-edged blades for the *L. denudatus* and rather simple and broad, fluted ridge for the *L. sp.*

3.3.3 Key of determination of Lepiotaceae species

1. a-Stipe with a curved base; with fibrous surface and with ascending and fixed rings
.....*Leucoagaricus bresadolae*
1. b- Stipe with bulbous base; smooth surface; with partial sliding or fixed veil (2)
2. a-Hat with conical shape and ribbed surface; hymenophore with unequal and tight blades; with smooth edge.....*Leucocoprinus denudatus*
2. b- Hat with a flat shape and a veined surface; hymenophore with simple and broad blades; fluted ridge.....*Leucocoprinus sp.*

4. CONCLUSION AND PERSPECTIVES

This work permitted to make a preliminary inventory of the species of Agaricales of the

fungus flora of some sites in the region of Dakar. It also to carry out a descriptive study of the macroscopic and ecological characteristics of these species. Therefore, this study, enabled to inventory 7 species among which 3 were identified. All of these species belong to 3 genera (*Agaricus*, *Leucoagaricus* and *Leucocoprinus*) and 2 families (Agaricaceae and Lepiotaceae). However, no species belonging to the Coprinaceae family was harvested in this study. The absence of Coprinaceae species in the places visited could be due to the short life of the carpophores which is of the order of a few hours in the Coprins. All the samples studied are saprophytes, most of them collected on a large wet litter. In addition, this work made it possible to describe the harvested samples and to propose species identification keys to facilitate their identification. A total of 12 samples of Agaricales were collected from the sites surveyed, that of the Hann Forest Park contains the majority of samples collected. Samples belonging to the genus *Agaricus* and *Leucocoprinus* were found in both the Mbaou Classified Forest and the Hann Forest Park, which is home to the only *Leucoagaricus*.

Nevertheless, there is a need for reservations as to the definite determination of the species harvested. Since the study is based on the description of the macromorphological and ecological characters, it is necessary to be very cautious in naming the collected samples. The micromorphological and molecular characteristics are essential in the determination of a fungus. Nevertheless, the determination of the species of *Agaricus* by Heinemann [17], was mainly based on the organoleptic characters (flavor, smell, taste, touch, wrinkling etc.) and in other cases on the chemical reactions by applying reagents on the flesh of the harvested samples.

This will be less obvious for Lepiotaceae whose determination or even the separation of genera is based on biochemical reactions observed under the microscope. This was not the case in this study. From this work, we plan to a) make a microscopy of the temporarily identified samples, the unidentified samples and those collected in the botanical gardens, which will allow us to possibly discover the presumed new species b) continue the systematic study of order by prospecting for other sites not yet explored; c) inventory all the species of Agaricales of economic interest in order to popularise them.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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