
Four species of wild *Auricularia* in Central Luzon, Philippines as sources of cell lines for researchers and mushroom growers

Reichard B. Musngi¹, Evaristo A. Abella¹, Apolonia L. Lalap¹ and Renato G. Reyes^{1*}

¹Center for Tropical Mushroom Research and Development, Department of Biological Sciences, College of Arts and Sciences, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines

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In this paper, we described the four species of *Auricularia* (*A. auricula*, *A. fuscossucinea*, *A. polytricha*, *A. tenuis*), which we have collected in the campus of the Central Luzon State University. Identification was based on their hyphal zonation. From each species, various strains were identified (i.e. 3 strains for *A. auricula*, 5 strains for *A. fuscossucinea*, 13 strains for *A. polytricha* and 4 strains for *A. tenuis*). Seven host trees for *Auricularia* were noted as follows: rain tree (*Samanea saman*), coconut (*Cocos nucifera*), ipil – ipil (*Leucaena leucocephala*), mahogany (*Sweitenia mahogany*), mango (*Mangifera indica*) and rubber tree (*Hevea brasiliensis*). Among these host trees, rain trees supported the highest number of *Auricularia* species identified.

Keywords: *Auricularia*, fungal taxonomy, mushroom, Philippine macrofungi

Introduction

Most taxonomic work on macrofungi in the Philippines has focused on general descriptions of *Basidiomycota*. Several local researchers have tried to document the different macrofungi that inhabit the mountainous areas of the country. For instance, Daep and Cajuday (2003) studied the mushroom diversity of Mt. Malinao, Albay where they documented 9 species of *Tricholomataceae*, 3 species of *Coprinaceae*, 2 species of *Pluteaceae* and 1 species of *Auriculariaceae*. Biadnes and Tangonan (2003) made an assessment of the species of basidiomycetous fungi of Mt. Apo, Mindanao. They recorded 87 species representing 25 genera with a total of 873 collections which were later identified. These included *Agaricus*, *Amanita*, *Armillaria*, *Cantharellus*, *Clavaria*, *Corticium*, *Coprinus*, *Cyphelia*, *Dictyophora*, *Fomes*, *Ganoderma*,

*Corresponding author: Renato G. Reyes; e-mail: boyongreyes@yahoo.com

Hydnum, Hygrocybe, Laetiporus, Marasmius, Phellinus, Phleogena, Pholiota, Polystictus, Rigidoporus, Russula, Schizophyllum, Stereum, Termitomyces and *Trametes* species. In Mt. Makiling, Laguna, Quimio (1996) conducted a floristic survey of the *Agaricales*. In Nueva Ecija, Reyes *et al.* (1997) successfully isolated the mycelia of *Collybia reinakena* from Puncan, Carranglan, Nueva Ecija, a virtually unknown edible species that proliferated after the great earthquake that jolted Luzon Island in 1991. Though *Auricularia* has already been reported by other researchers in the Philippines as mentioned previously, we are reporting herewith a detailed taxonomic description of four species of *Auricularia* in Central Luzon, Philippines. This investigation is so far the first published in depth taxonomic account of this genus in the Philippines.

Materials and methods

Collection

The specimens on which this study was based were collected in the different locations at the Central Luzon State University, a national university that sits in a 656 ha reservation. Collected specimens are deposited in the Mycology Laboratory of the Department of Biological Sciences, College of Arts and Sciences, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines. All of the available basidiocarps of *Auricularia* were gathered from the various habitats with the aid of a knife, air-dried and placed in herbarium envelope. Notes were carefully taken during collection with the habitats of each sample specimens and their respective date of collection.

Identification to species

The texture and color of the pileus and hymenia were observed. Soaking in tap water for ten minutes facilitated the rehydration of the dried specimen (Lowry, 1951). For the microscopic characters of basidiocarps, free hand sections were made perpendicular to the superior surface of these basidiocarps approximately 0.1 mm thick with the aid of a surgical blade. These were mounted in water and carefully observed using a compound microscope. Measurement of all zones from the hymenial to the pileus layer were done using a screw calibrated filar micrometer. Morphological features of the hairs (length and shape of the tip) were measured and characterized.

Auricularia species were photographed *in toto*, and photomicrographed in section. Photographs of mature basidiocarps were selected following the

examination of large members of species in their typical form. Diagrammatic illustration showing the internal features and the context of the different zonal regions was made.

Results

Four species of *Auricularia* were collected and identified: *A. auricula*, *A. fuscossucinea*, *A. polytricha* and *A. tenuis*.

Morpho-anatomical characteristics of Auricularia

The basidiocarp of *Auricularia* was characterized to be rubbery and gelatinous. Its structure varies from discoid, cupulate, auriform, and resupinate with reflex margins; sessile, substipitate, or rarely stipitate; thin, translucent to opaque, brittle when dry. The basidiocarps grow saprobially; usually solitary to gregarious; upper surface pileus, hairs 65-500 μm or more in length; lower surface bearing the hymenium, which is externally glabrous to pruinose, often with verrulose folds; the colour of these basidiocarps ranges from light to dark brown or black; cross section perpendicular to superior surface showing hyphal organization of characteristic morphology with discernible zonations; hymenium unilateral and dense; the basidia are cylindrical to clavate, transversely triseptate; the sterigmata are elongated

As reported previously, this genus includes eleven species (Lowy, 1952). Eight of them have been found in the Philippines (Lalap, 1981). Among these, four were found in Central Luzon, which therefore, serves as source of genetic resources for researchers and mushroom growers. A brief description of these species which was based from the work of Lowy (1952) is given below.

Description of the species

Auricularia auricula

Basidiocarps tough and gelatinous when fresh, commonly solitary, occasionally gregarious or caespitose becoming variously convoluted upon maturity; yellow-brown to reddish-brown when moist; sessile to substipitate, up to 12 cm broad, 0.8-1.2 mm thick (Fig. 1). Internal structure. *Zona pilosa*: Hairs 80-100 μm long; *Zona compacta*: 60-70 μm wide individual elements not distinguishable; *Zona subcompacta superioris*: 115-130 μm wide, a dense network giving the zone a somewhat coarsely granular appearance; *Zona laxa intermedia*: 245-300 μm wide, horizontal in orientation, with numerous small

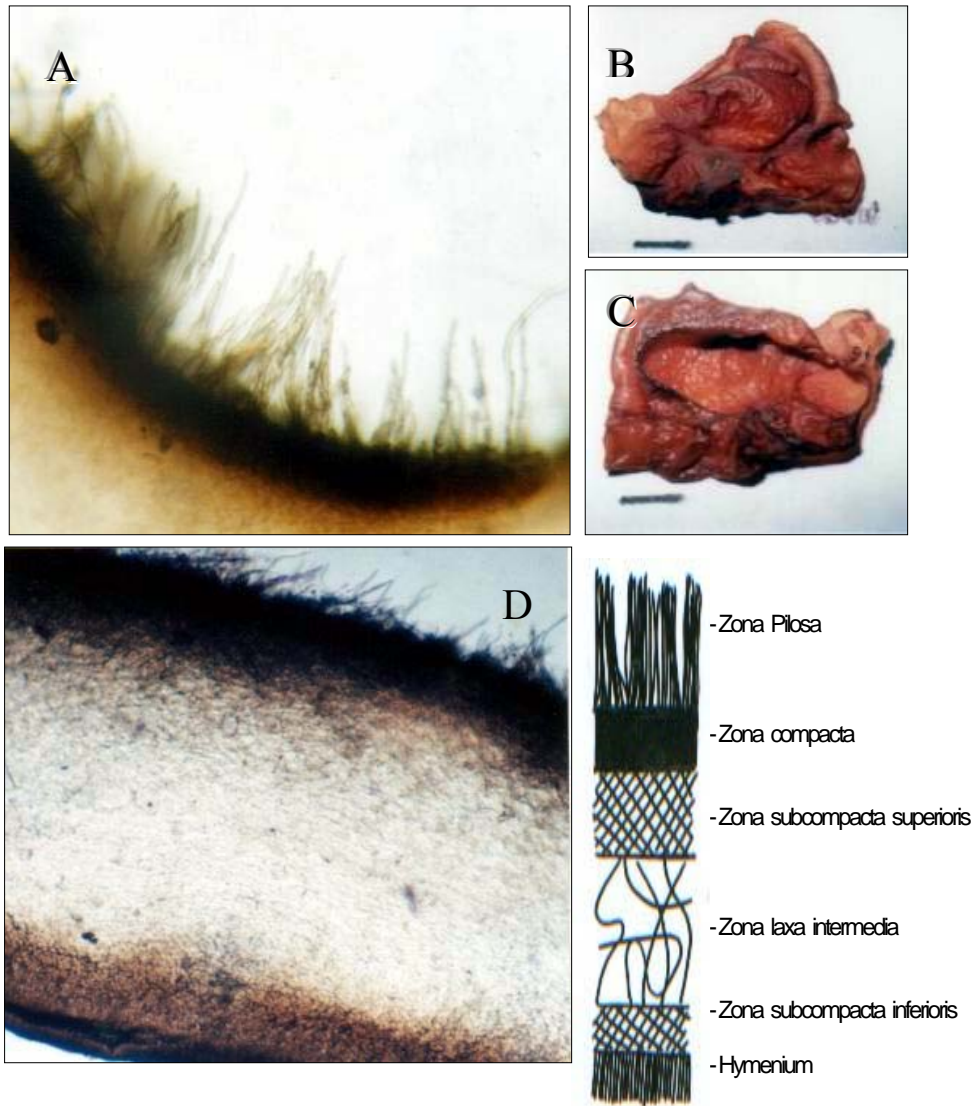


Fig. 1. Morpho – anatomical features of *Auricularia auricula*. **A.** Hairs (100×) Mature basidiocarps (Bar = 20mm). **B.** Pilose layer. **C.** Hymenial surface, **D.** Cross section of the basidiocarp (40×) (left) showing the internal hyphal zonation and the diagrammatic representation of the hyphal zonation (right).

interstices; *Zona subcompacta inferioris*: 100-120 μm wide, a densely compact layer. *Hymenium*: about 150 μm thick. (Table 1).

Habitat: On dead wood of *Mangifera indica* L. (mango), *Sweitenia mahogany* Jacq. (mahogany) and on dead wood of unknown host.

Material examined: Botanical Garden: BG 1; Lingap Kalikasan: LK 2, 12 and 15; Public Affairs Office: PAO 16.

Auricularia fuscossucinea

Basidiocarps mostly pileate, solitary to gregarious, thin, translucent when dry, largest specimen about 12 cm. broad, 0.5-0.8 mm. thick. *Basidiocarp* gelatinous; solitary or gregarious; translucent when dry; rosy to veinaceous when fresh; sessile to substipitate (Fig. 2). Internal structure. *Zona pilosa* with hairs about 50-85 μm long, tips rounded, scant, never forming tufts; *Zona compacta* about 25-35 μm wide; *Zona subcompacta superioris* about 15-20 μm wide; *Zona laxa superioris* about 140-150 μm wide; *Medulla* about 35-50 μm wide; *Zona subcompacta inferioris* about 60-70 μm wide; *Hymenium* about 70 - 80 μm thick (Table 1).

Habitat: This species grows on dead *Mangifera indica* L. (mango), *Samanea saman* Jacq. (rain tree) and on dead wood of unknown host.

Material examined: Auditorium and Graduation site: AGS 3 and 14; Botanical Garden: BG 8 and 15; College of Veterinary Science and Medicine: VM 9 and 24; CLSU Credit Coop: CP 3,12 and 17; Lingap Kalikasan: LK 6,13 and 24; Ladies' Dorm 7 and 8: D-7&8 2, 4 and 9; Public Affairs Office: PAO 5; Rizal Park: RP 16.

Auricularia polytricha

Basidiocarps frequently having a strongly convex dorsal surface, densely pileus, largest specimen 5-6 cm. broad, 1-1.5 mm. thick (Fig. 3). Internal structure. *Zona pilosa*: Hairs from 450 μm long up, hyaline, 5-6 μm in diameter, forming dense tufts, with prominent central strand, tips pointed but frequently broken, appearing truncate; *Zona compacta*: 20-40 μm wide, densely compacted, individual hyphae not distinguishable. *Zona subcompacta superioris*: 75-85 μm wide, hyphae 2-3 μm in diameter, oriented mostly perpendicular with the surface. *Zona laxa superioris*: 250-260 μm wide; *Medulla*: 250 μm ; *Zona laxa inferioris*: 250-260 μm ; *Zona subcompacta inferioris*: 90-100 μm wide; *Hymenium*: 80-90 μm wide (Table 1).

Habitat: This species was found growing abundantly on dead trunk and branches of *Cocos nucifera* L. (coconut), *Mangifera indica* L. (mango), *Samanea saman* Jacq. (rain tree), *Hevea brasiliensis* Muell. Arg. (rubber tree), *Sweitenia mahogany* Jacq. (mahogany) and on decaying wood that has been used as fence.

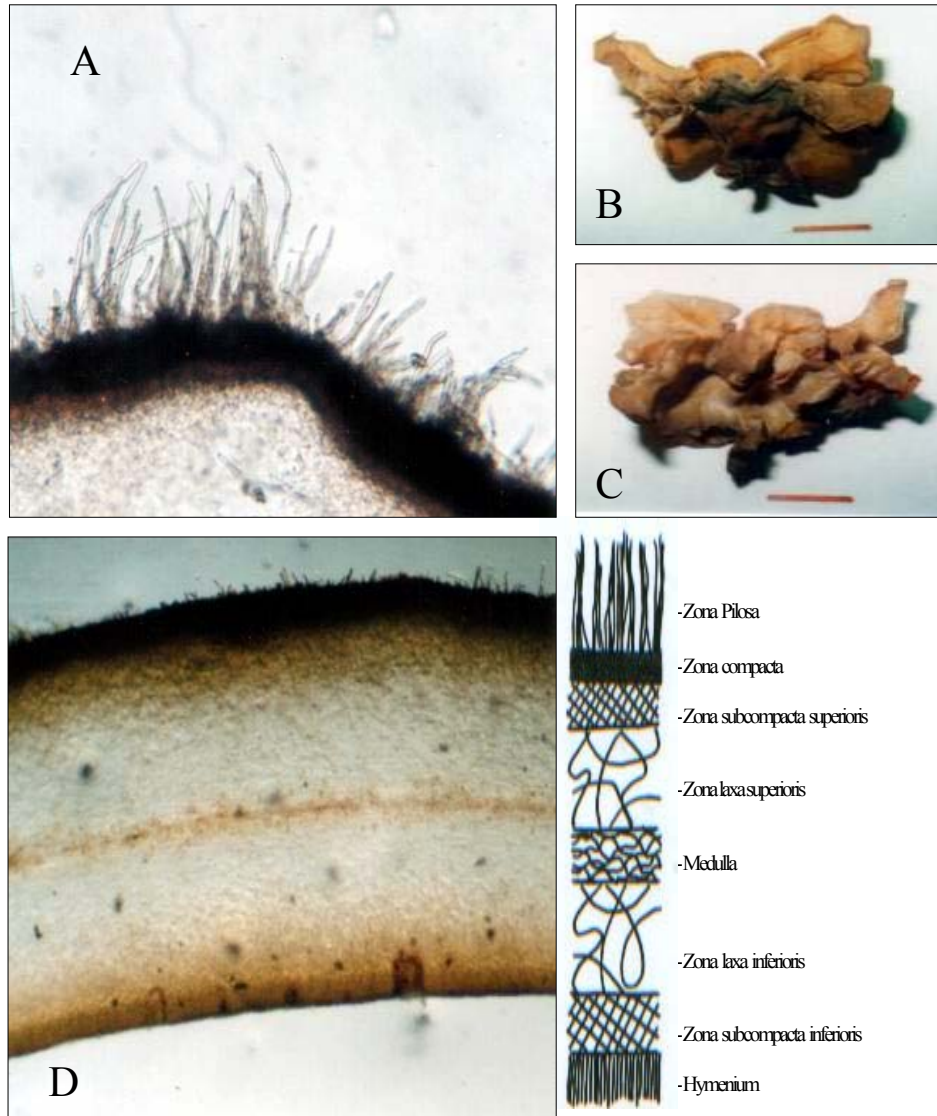


Fig. 2. Morpho – anatomical features of *Auricularia fuscossucinea*. **A.** Hairs (100×) Mature basidiocarps (Bar = 20mm). **B.** Pilose layer. **C.** Hymenial surfaces. **D.** Cross section of basidiocarp (40×) (left) showing the narrow medulla and diagrammatic representation of the hyphal zonation (right).

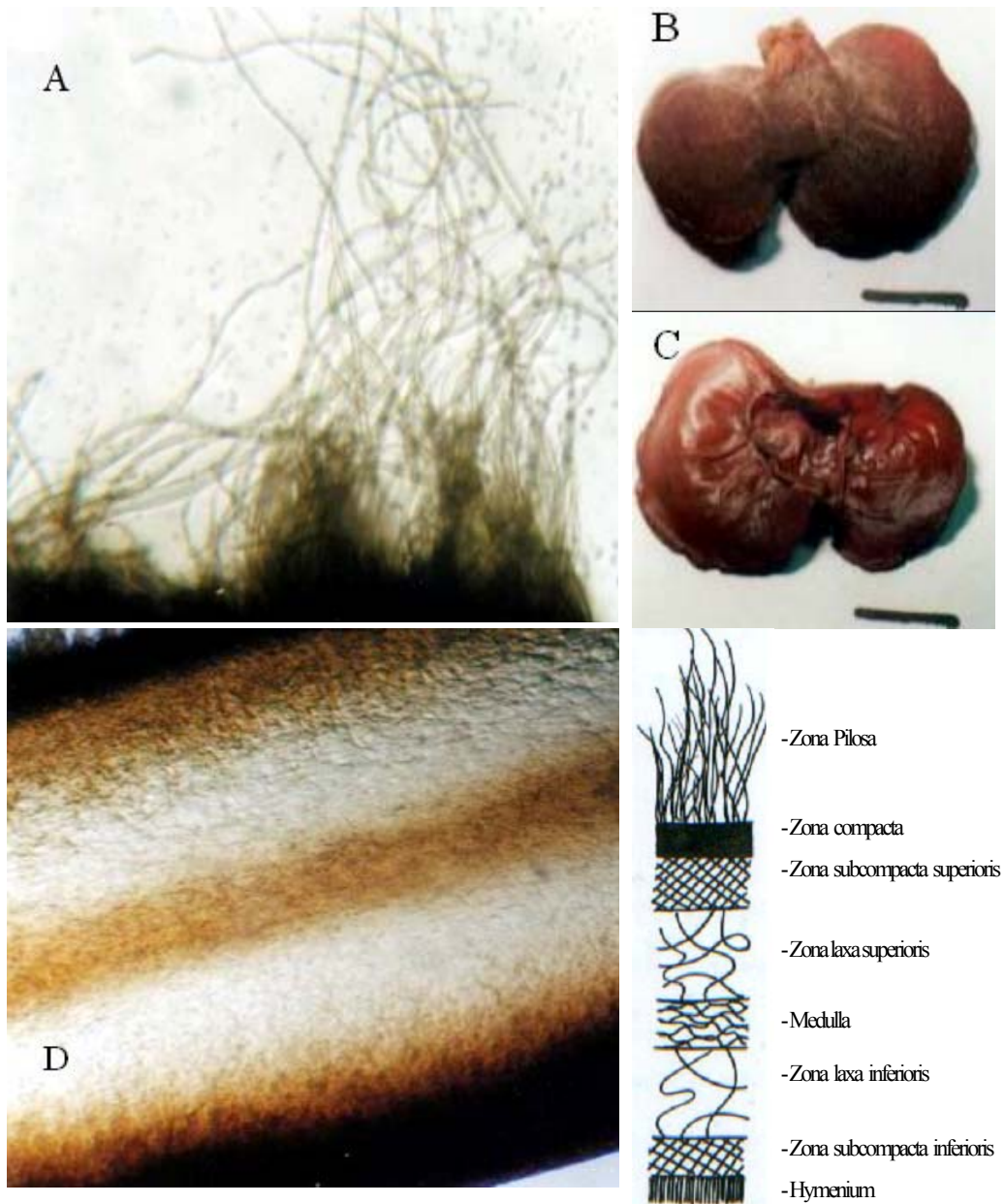


Fig. 3. Morpho – anatomical features of *Auricularia polytricha*. **A.** Hairs (100×). Mature basidiocarps (Bar = 20 mm). **B.** Pilose layer. **C.** Hymenial surface. **D.** Cross – section of the basidiocarp (40×) (left) showing the compact centrally oriented medulla and diagrammatic representation of the hyphal zonation (right).

Material examined: Rizal Park: RP 1, 11, 13, 15, 17 and 20; Auditorium and Graduation site: AGS 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19 and 20; Botanical Garden: BG 2, 4, 5, 6, 7, 8, 10, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, and 25; Church Area: CH 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19 and 20; College of Agriculture: AG 2, 3, 4, 5, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 19, 20, 22 and 25; College of Veterinary Science and Medicine: VM 1, 2, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23 and 25; CLSU Credit Coop: CP 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 18, 19 and 20; Dairy Project: DY 10; Lingap Kalikasan: LK 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 14, 16, 17, 18, 19, 20, 21, 22, 23 and 25.

Auricularia tenuis

Basidiocarps mostly solitary 0.8-1.0 mm. thick, tough-gelatinous when wet, up to 8-10 cm. in length. Basidiocarp tough gelatinous, mostly solitary (Fig. 4). Internal structure. *Zona pilosa* with hairs about 85-100 μm long, hyaline to light brown, central strand prominent, tips rounded; *Zona compacta*: 40-50 μm wide; *Zona subcompacta superioris*: about 20-30 μm wide; *Zona laxa superioris*: 195-210 μm wide; *Medulla*: 190-210 μm , composed of two dense strands each about 75 μm wide, separated from each other by a zone of loosely arranged hyphae 30-40 μm wide; *Zona laxa inferioris*: 170-185 μm ; *Zona subcompacta inferioris*: 20-30 μm wide; *Hymenium*: 80-90 μm wide (Table 1).

Habitat: This species was collected on dead tree trunk of *Samanea saman* Jacq. (rain tree) and on decaying stump of unknown hosts.

Material examined: Botanical Garden: BG 3; College of Agriculture: AG 1, 6, 12, 18, 21, 23, and 24; Rizal Park: RP 12.

Strains of the species of Auricularia

Different strains of each species of *Auricularia* were identified (Table 2). The identification was based on the superficial characteristics of the mature basidiocarp upon collection. The superficial characteristics include the colour, texture of the pileus and hymenial layer, shape, type of margin, and the organization of each species. Our identifications may not be exact for all species in the differentiation of strains, due to the reason that these superficial characteristics may result from environmental factors such as temperature, sunlight, humidity, and some physical factors that vary from time to time and from one place to the other. This identification could also provide some information that may be used in the field to differentiate one species from the other.

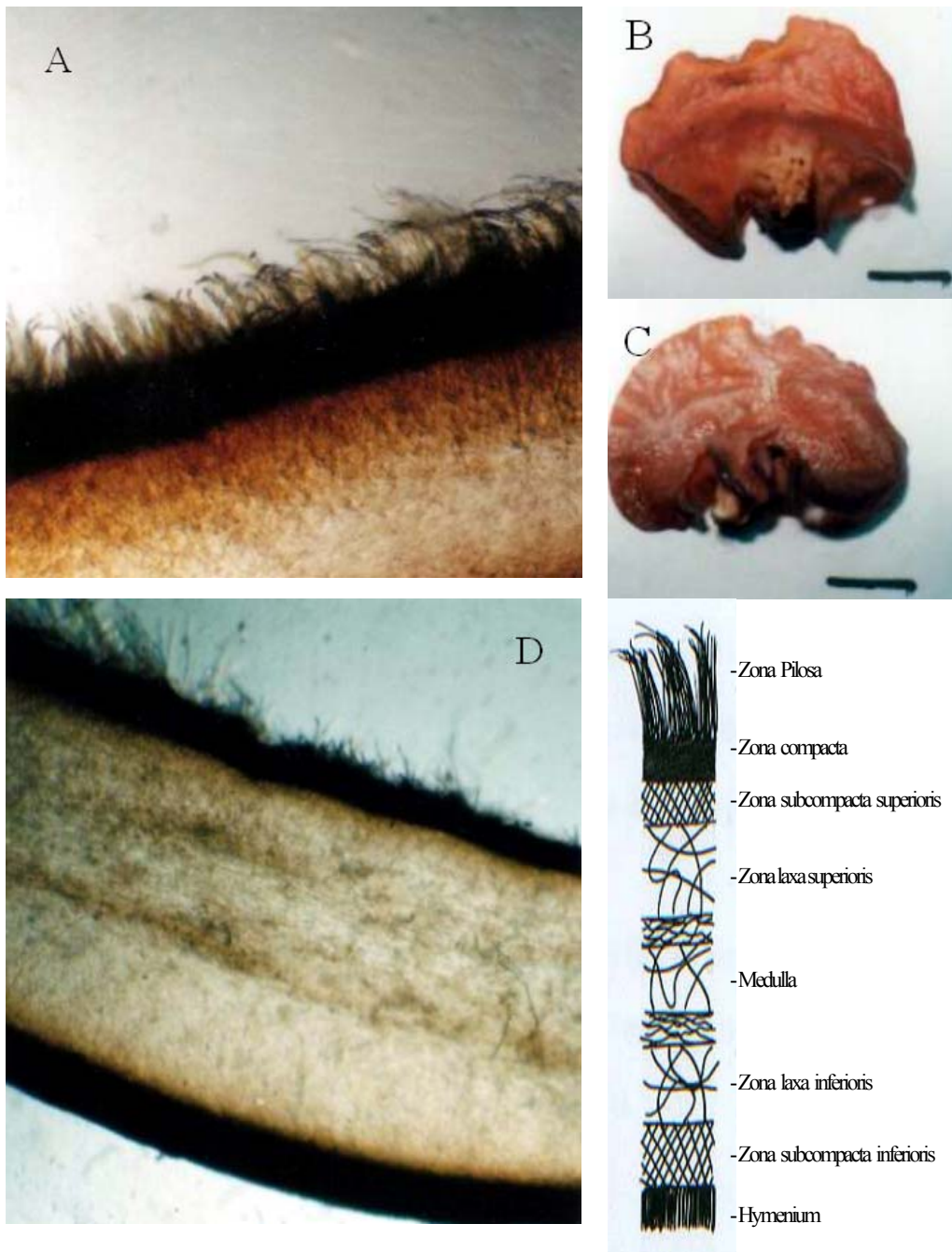


Fig. 4. Morpho – anatomical features of *Auricularia tenuis*. **A.** Hairs (100×). **B.** Mature basidiocarps (Bar = 20mm). Pilose layer. **C.** Hymenial surface. **D.** Cross – section of the basidiocarp (40×) (left) and diagrammatic representation of the hyphal zonation (right)

Description of each strain within species

Auricularia auricula

Three strains were identified (Fig. 5). Strain 1 was characterized by having yellow to reddish-brown basidiocarps, with smooth and venous textures for the pileus and hymenium respectively, irregularly cupulate, with a wavy margin, and solitary. The second strain was red-yellow to dark brown, smooth with few veins on the pileus, irregular in shape, solitary and with a wavy margin. The third strain was orange to dark red, both hymenium and pileus venous, irregular in shape, solitary and with a wavy margin (Table 2).

Auricularia fuscosuccinea

Five strains were identified (Fig. 6). The first strain was characterized by yellow-brown to dark brown basidiocarps, with a venous texture and smooth for the pileus and hymenium respectively, irregularly shaped, with rounded margin, and gregarious. The second strain was light yellow to brown, both smooth with few veins on the hymenium, irregular in shape, gregarious and with a rounded margin. The third strain was yellow-brown, hymenium smooth and pileus with few veins, irregular in shape, solitary and with a wavy margin. The fourth strain was light yellow to brown, both the pileous and hymenium venous, whorled, solitary and with a wavy margin. The fifth strain was red to yellow, both hymenium and pileus smooth, cupules, solitary and with a rounded margin (Table 2).

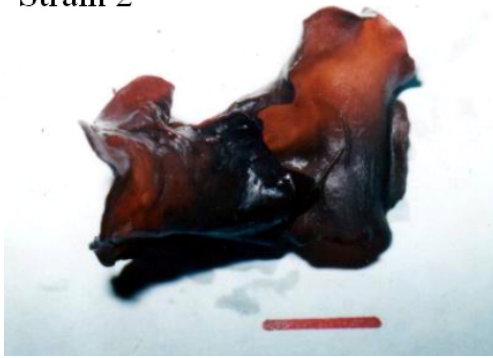
Auricularia polytricha

Thirteen strains were identified (Fig. 7a-c). The first strain was characterized by having a dark brown to black basidicarp, with a smooth texture and with veins for the pilae and hymenium respectively, bilobed, with a rounded margin, and solitary. The second strain was dark brown to black, both smooth with few veins on the hymenium, cupulate, solitary and with a rounded margin. The third strain was dark brown to black, hymenium and pilae smooth, irregular in shape, solitary and with a rounded margin. The fourth strain was brown, both the pileus and hymenium smooth, irregular in shape, solitary and with a rounded margin. The fifth strain was red to brown, both hymenium and pileus venous, cuboidal, solitary and with a flattened margin. The sixth strain was characterized as having a brown basidiocarp with yellow hairs, with a smooth and hairy texture, few veins for the pileus and hymenium respectively, irregular in shaped, with a thick and curly margin and solitary. The seventh

Strain 1



Strain 2



Strain 3

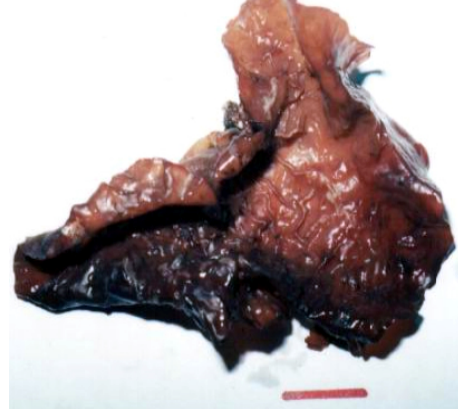


Fig. 5. Variations within *Auricularia auricula*. Right photo: hymenial surface; Left photo: pilose layer; bar = 20 mm

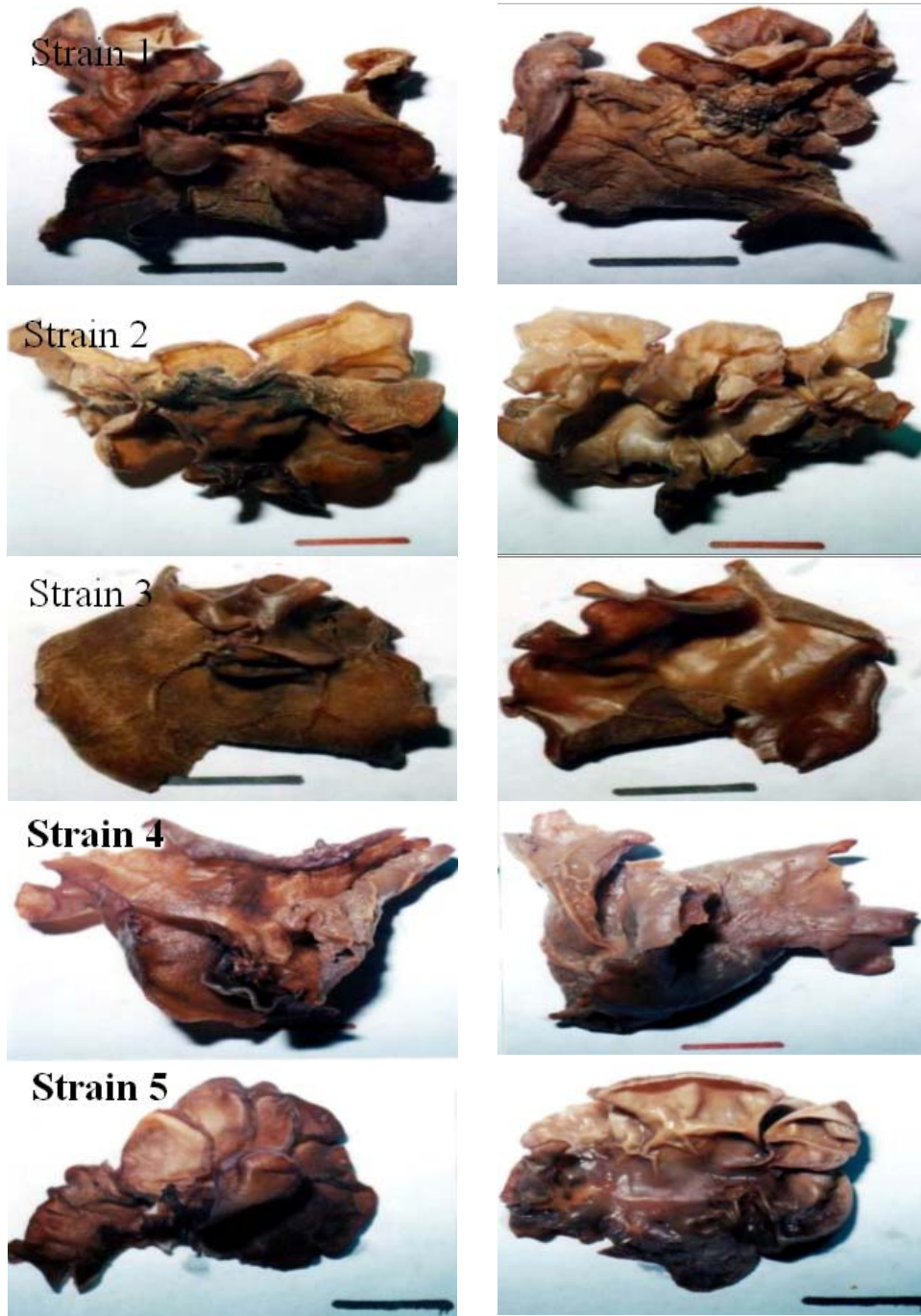


Fig. 6. Variations within *A. fuscossucinea*, Right photo: hymenial surface; left photo: pilose layer, bar = 20 mm

strain was yellow to brown, both pileus and hymenium smooth, cupulate, solitary and with a thick rounded margin. The eighth strain was brown to black, hymenium and pileus smooth, irregular in shape, solitary and with a wavy margin. The ninth strain was brown with yellow-brown hairs, pileus hairy and hymenium smooth, irregularly rounded, solitary and with a rounded margin. The tenth strain was dark violet to black, hymenium venous and pileus hairy, irregular, solitary and with a wavy margin. The eleventh strain was characterized by having black basidiocarps, with a smooth texture for the pileus and hymenium, hearth-shaped, with a thick rounded margin, and solitary. The twelfth strain was brown with yellow-brown hairs, hymenium smooth and pileus hairy, circular, gregarious and with a thick rounded margin. The thirteenth strain was dark violet to black, both hymenium and pileus smooth with few veins, stellate, solitary and with a thick rounded margin (Table 2).

Auricularia tenuis

Four strains were identified (Fig. 8). The first strain was characterized as having red orange basidiocarps, with a coarse texture for both pileus and hymenium, oval, with a rounded margin, and solitary. The second strain was yellow-brown, both the pileus and hymenium slimy, irregularly rounded, solitary and with a wavy margin. The third strain was dark blue to black, hymenium slimy and pileus slimy and venous, semi-circular, solitary and with a rounded margin. The fourth strain was brown, both the pileus and hymenium slimy and venous, irregularly rounded and cupulate, solitary and with a wavy margin (Table 2).

Discussion

We described the different species of *Auricularia* based on their hyphal zonations. Each species within the genus were identified based on superficial characteristics in addition to hyphal zonation (Lowy, 1952).

Four *Auricularia* species in the Central Luzon State University have been described and reported. All these species grow in a variety of habitats ranging from decayed branches of living and dead trees, small and fallen decayed twigs, stumps and decayed logs. The basidiocarp of *Auricularia* exhibit different forms of growth depending on the condition of the environment. In few instances, lobes are produced either in groups of two or three, others are cupulate and stipitate. Of special interest, was the occurrence of *A. auricula*, *A. fuscosuccinea* and *A. tenuis*, which have not been reported to occur previously



Fig. 7a. Variations within *Auricularia polytricha*. Right photo: hymenial surface; Left photo: pilose layer; bar = 20 mm.



Fig. 7b. Variations within *Auricularia polytricha*. Right photo: hymenial surface; Left photo: pilose layer; bar = 20 mm.



Fig. 7c. Variations within *Auricularia polytricha*. Right photo: hymenial surface; Left photo: pilose layer; bar = 20 mm.

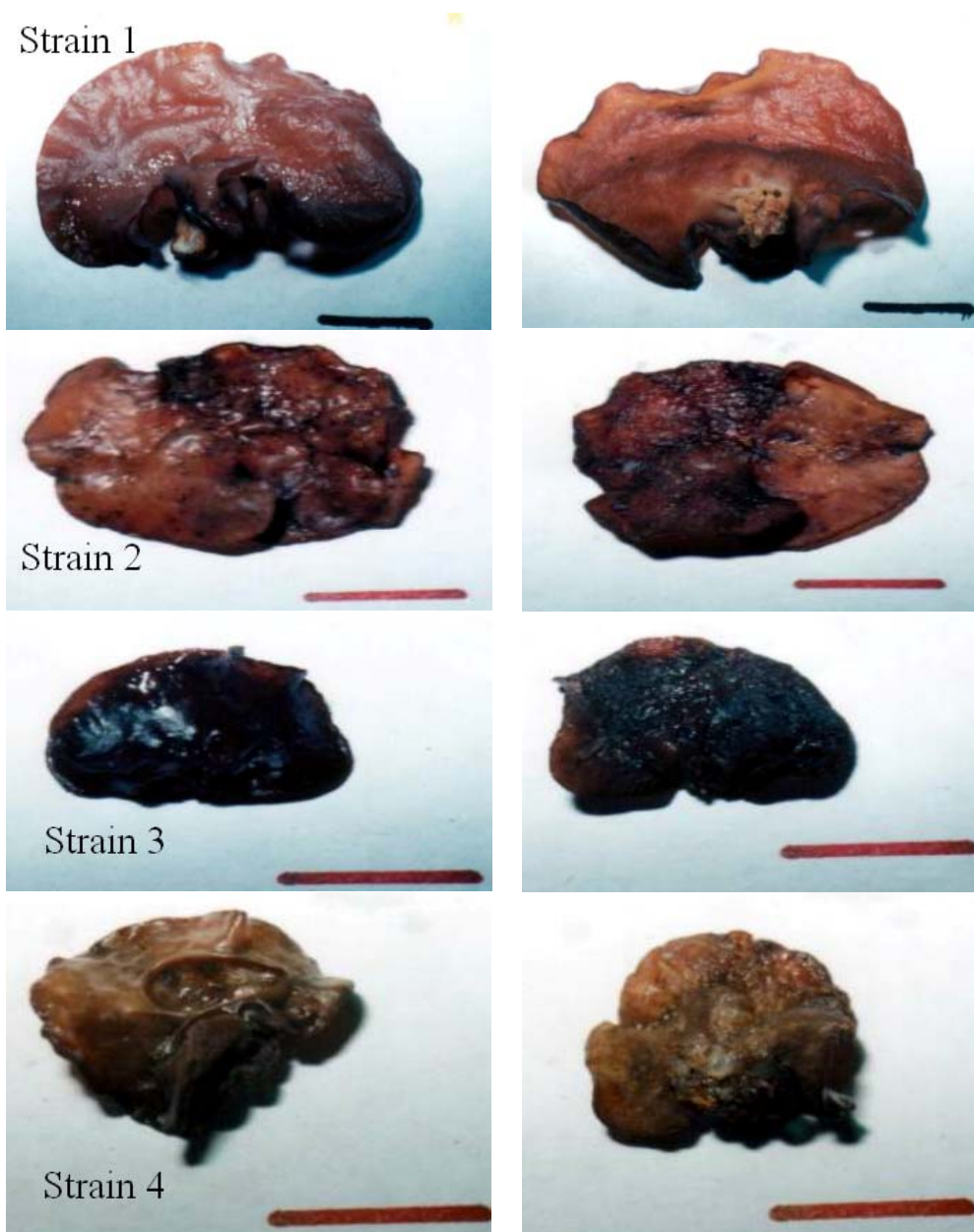


Fig. 8. Variations within *Auricularia tenuis*. Right photo: hymenial surface; Left photo: pilose layer; bar = 20 mm.

in Central Luzon. Among the species collected, *A. polytricha* has the greatest diversity of habitat. It had occurred in all the collection sites. The least common was *A. auricula* and *A. tenuis*.

We also have identified different strains of each species. The identification was based only on the superficial characteristics of the mature basidiocarp upon collection. The superficial characteristics include the colour, texture of the pileus and hymenial layer, shape, type of margin, and the organization of each species. Three strains were identified for *A. auricula*, five for *A. fuscusuccinea*, 13 for *A. polytricha* and four strains for *A. tenuis*.

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