REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 22/04/2026
Vol: 13.07
DOI: 10.66104/59ets318
Pages: 1-20

PRELIMINARY ISOLATION OF CULTIVABLE FUNGI ASSOCIATED WITH MACROFUNGI COMPATIBLE WITH *Dacryopinax spathularia* AND *Aleuria* sp. IN URBAN AMAZONIA

ISOLAMENTO PRELIMINAR DE FUNGOS CULTIVÁVEIS ASSOCIADOS A MACROFUNGOS COMPATÍVEIS COM *Dacryopinax spathularia* E *Aleuria* sp. EM AMBIENTE URBANO DA A

AISLAMIENTO PRELIMINAR DE HONGOS CULTIVABLES ASOCIADOS A MACROHONGOS COMPATIBLES CON *Dacryopinax spathularia* Y *Aleuria sp*. EN UN AMBIENTE URBANO DE LA AMAZONÍA

Tainara Tourinho Ribeiro
Graduanda em de Ciências Biológicas, Centro de Estudos Superiores de Tabatinga-UEA, Brasil
E-mail: ttr.bio21@uea.edu.br

Paulo Alexandre Lima Santiago
Doutor em Química, Centro de Estudos Superiores de Tabatinga -UEA, Brasil
E-mail: psantiago@uea.edu.br

Sarah Raquel Silveira da Silva Santiago
Doutora em Biodiversidade e Biotecnologia, Secretaria de Estado de Educação do Amazonas (SEDUC), Brasil
E-mail: srhraquel@gmail.com

Alessandra Kedma Giles Lopes
Mestranda em Biodiversidade e Ensino de Ciências Naturais na Amazônia, Centro de Estudos Superiores de Tabatinga-UEA, Brasil
E-mail: akgl.cna26@uea.edu.br

Abstract

This study aimed to isolate and morphologically characterize fungal strains associated with specimens morphologically compatible with *Dacryopinax spathularia* and *Aleuria* sp. collected in an urban environment in the municipality of Tabatinga, Amazonas, Brazil. Macrofungi were sampled from anthropogenic substrates and subjected to isolation on Potato Dextrose Agar (PDA), followed by macromorphological and micromorphological analyses. Six fungal isolates were obtained and differentiated based on colony characteristics such as color, texture, growth pattern, and diameter. Micromorphological analysis allowed the preliminary identification of one isolate as *Penicillium* sp., based on the presence of septate hyphae, branched conidiophores, metulae, and phialides forming typical penicillate structures. The occurrence of *D. spathularia* and *Aleuria* sp. in an urban environment

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 22/04/2026
Vol: 13.07
DOI: 10.66104/59ets318
Pages: 1-20

highlights the adaptability of macrofungi to anthropogenic conditions and their ecological role in the decomposition of organic matter. Additionally, the observed morphological characteristics suggest potential biotechnological applications, particularly related to the production of enzymes and bioactive compounds. The results reinforce the importance of urban environments as reservoirs of fungal biodiversity in the Amazon and highlight the need for further molecular and biochemical studies to explore the metabolic potential of these organisms.
Keywords: Macrofungi; Decomposition; Amazon; Tabatinga.

Resumo
Este estudo teve como objetivo isolar e caracterizar morfologicamente cepas fúngicas associadas a espécimes morfologicamente compatíveis com *Dacryopinax spathularia* e *Aleuria* sp., coletadas em ambiente urbano no município de Tabatinga, Amazonas, Brasil. Os macrofungos foram obtidos a partir de substratos antropogênicos e submetidos ao isolamento em meio Batata-Dextrose-Ágar (BDA), seguido de análises macro e micromorfológicas. Foram obtidos seis isolados fúngicos, diferenciados com base em características como cor, textura, padrão de crescimento e diâmetro das colônias. A análise micromorfológica permitiu a identificação preliminar de um dos isolados como pertencente ao gênero *Penicillium*, com base na presença de hifas septadas, conidióforos ramificados, métulas e fiálides formando estruturas típicas do gênero. A ocorrência de *D. spathularia* e *Aleuria* sp. em ambiente urbano evidencia a capacidade de adaptação desses macrofungos a condições antropizadas e seu papel ecológico na decomposição da matéria orgânica. Além disso, as características observadas sugerem potencial biotecnológico, especialmente relacionado à produção de enzimas e compostos bioativos. Os resultados reforçam a importância de ambientes urbanos como reservatórios de biodiversidade fúngica na Amazônia e destacam a necessidade de estudos moleculares e bioquímicos para exploração do potencial metabólico dessas espécies.
Palavras-chaves: Macrofungos; Decompositores, Amazônia; Tabatinga.

Resumen
Este estudio tuvo como objetivo aislar y caracterizar morfológicamente cepas fúngicas asociadas a especímenes morfológicamente compatibles con *Dacryopinax spathularia* y *Aleuria* sp., recolectados en un ambiente urbano del municipio de Tabatinga, Amazonas, Brasil. Los macrohongos fueron obtenidos a partir de sustratos antropogénicos y sometidos a aislamiento en medio Papa-Dextrosa-Agar (PDA), seguido de análisis macro y micromorfológicos. Se obtuvieron seis aislamientos fúngicos, diferenciados en función de características como color, textura, patrón de crecimiento y diámetro de las colonias. El análisis micromorfológico permitió la identificación preliminar de uno de los aislamientos como perteneciente al género *Penicillium*, basada en la presencia de hifas septadas, conidióforos ramificados, métulas y fiálides formando estructuras típicas del género.
La ocurrencia de *D. spathularia* y *Aleuria* sp. en ambiente urbano evidencia la capacidad de adaptación de estos macrohongos a condiciones antropizadas y su papel ecológico en la descomposición de la materia orgánica. Además, las características observadas sugieren un potencial biotecnológico, especialmente relacionado con la producción de enzimas y compuestos bioactivos. Los resultados refuerzan la importancia de los ambientes urbanos como reservorios de biodiversidad fúngica en la Amazonía y destacan la necesidad de estudios moleculares y bioquímicos para confirmar la identidad taxonómica y explorar el potencial metabólico de los aislamientos obtenidos.
Palabras clave: Macrohongos; Descomposición; Amazonía; Tabatinga.

1. Introdution

Macrofungi play a fundamental role in terrestrial ecosystems, acting as decomposers and actively participating in nutrient cycling. These organisms are commonly found in decaying plant substrates such as trunks, branches, and leaf litter, especially in humid forest environments (GOMES *et al*., 2023). In the Amazonian context, the Upper Solimões region stands out due to the presence of

REMUNOM
ISSN 2178-6925
Received: 13/01/2026 - **Accepted:** 22/04/2026
Vol: 13.07
DOI: 10.66104/59ets318
Pages: 1-20

floodplains, river islands, and diverse phytophysiognomies that favor high mycological richness. However, systematic knowledge of this diversity remains limited (BARBOSA, SOUZA, & ALMEIDA, 2021).

The genus *Dacryopinax* (family Dacrymycetaceae) has attracted attention due to its ecological and biotechnological relevance. Genomic studies of species such as *Dacryopinax spathularia*, for example, have demonstrated its ability to degrade lignocellulosic material and to encode pathways involved in the biosynthesis of long-chain glycolipids, suggesting potential applications in the food industry (CHEANG *et al*., 2024). Morphologically, *D. spathularia* is characterized by spatula- or fan-shaped, yellowish-orange basidiomata that develop on decaying wood, with a wide geographic distribution across the Americas, Australia, and other regions (BARBERÁN *et al*., 2021).

Another relevant genus is *Aleuria,* commonly known as the “orange peel fungus.” This group comprises cup-shaped ascomycetes with intense orange coloration that typically develop in disturbed soils, trails, and roadside environments. The hymenium exhibits a vivid coloration that contrasts with the paler outer surface (FONSECA, 2019). Studies involving related fungi have highlighted the presence of bioactive compounds, such as fucose-specific lectins, which have attracted interest in molecular biology and biochemistry (PEREIRA *et al*., 2020).

The need for systematic studies in the Upper Solimões region is evident, particularly those focused on the characterization of macrofungal diversity, including isolation, identification, and investigation of bioactive metabolites. Research integrating taxonomic, ecological, and biotechnological approaches is essential to fill existing scientific gaps and support conservation strategies for fungal biodiversity.

Therefore, this study aimed to isolate and preliminarily characterize cultivable fungi recovered from specimens morphologically compatible with *D. spathularia* and *Aleuria* sp. collected in an urban environment in Tabatinga, Amazonas.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 22/04/2026
Vol: 13.07
DOI: 10.66104/59ets318
Pages: 1-20

2. Theoretical Framework

2.1 Biodiversity of macrofungi in the Amazon region, with emphasis on the Upper Solimões

The Amazon is widely recognized as one of the largest reservoirs of global biodiversity, encompassing a vast diversity of plant, animal, and fungal species. Among these organisms, macrofungi stand out due to their ecological relevance and biotechnological potential. Despite this richness, fungal diversity in the Amazon remains largely underexplored, particularly in regions such as the Upper Solimões, where dense forests and floodplain environments create highly favorable conditions for fungal development (TEDERSOO *et al*., 2014).

Macrofungi play a fundamental role in ecological processes, especially in the decomposition of organic matter and nutrient cycling. In addition to their ecological importance, these organisms have been increasingly recognized for their potential applications in pharmacology, biotechnology, and the food industry. Studies indicate that Amazonian fungi produce a wide range of bioactive compounds, reinforcing the need to expand taxonomic, ecological, and biotechnological research in this region (PEREIRA *et al*., 2020).

The Upper Solimões region is considered a biological heritage of high scientific value, whose sustainable use may generate significant social, economic, and environmental benefits for the state of Amazonas (ZHANG *et al*., 2021). In this context, studies focusing on macrofungi in this region contribute not only to the expansion of scientific knowledge but also to biodiversity conservation and the development of sustainable technological strategies.

Therefore, investigating macrofungi in urban environments within the Upper Solimões region is essential to better understand their diversity and ecological roles under anthropogenic influence.

2.2 Genus Dacryopinax – Morphological characteristics, distribution, importance and applications

The genus *Dacryopinax,* belonging to the division Basidiomycota, is widely distributed in tropical and subtropical environments. Species of this genus are

REMUNOM
ISSN 2178-6925
Received: 13/01/2026 - **Accepted:** 22/04/2026
Vol: 13.07
DOI: 10.66104/59ets318
Pages: 1-20

characterized by gelatinous fruiting bodies, typically orange in color, which develop on decaying wood and other lignocellulosic substrates (ALMEIDA *et al*., 2019).

From an ecological perspective, *Dacryopinax* species play an important role in the decomposition of organic matter, particularly in the breakdown of lignocellulosic materials, contributing to nutrient cycling in forest ecosystems.

In addition to their ecological relevance, these fungi have attracted scientific interest due to their biotechnological potential. Studies indicate that species of this genus produce ligninolytic enzymes capable of degrading complex organic compounds, which makes them promising candidates for applications in biodegradation processes and the development of biocatalysts (BLACKWELL, 2011).

Despite their importance, records of *Dacryopinax* species in the Upper Solimões region remain limited, highlighting the need for studies focused on the isolation, characterization, and identification of native strains in this area (NEVES & BASEIA, 2017).

2.3 Dacryopinax spathularia – Morphology and Application

D. spathularia is a basidiomycete species commonly found in tropical and subtropical regions, where it grows on decaying wood and other lignocellulosic substrates. It is characterized by gelatinous, spatulate fruiting bodies with an orange coloration, which develop in humid forest environments (DEACON, 2013).

From an ecological perspective, *D. spathularia* plays an important role in the decomposition of plant material, contributing to the degradation of lignocellulosic compounds and nutrient cycling within forest ecosystems.

In recent years, this species has attracted increasing attention due to its biotechnological potential. Studies indicate that *D. spathularia* is capable of producing ligninolytic enzymes and antioxidant compounds, which may have applications in the food, pharmaceutical, and environmental sectors (LIMA *et al*., 2022). These enzymatic systems are particularly relevant for processes such as biodegradation of organic residues and bioconversion of plant biomass.

In the Amazon region, especially in the Upper Solimões, studies involving *D. spathularia* are still limited. This highlights the importance of investigations focused on the isolation, characterization, and evaluation of native strains, particularly in

REMUNOM
ISSN 2178-6925
Received: 13/01/2026 - **Accepted:** 22/04/2026
Vol: 13.07
DOI: 10.66104/59ets318
Pages: 1-20

urban environments where environmental conditions may influence fungal growth and adaptation (CARVALHO & MENDES, 2022).

2.4 Genus Aleuria – General characteristics, classification, and biological relevance

The genus *Aleuria*, belonging to the phylum Ascomycota, comprises species characterized by brightly colored, cup-shaped fruiting bodies (apothecia), typically found in soils, forest edges, and disturbed environments (FONSECA, 2019). These fungi are widely distributed and exhibit a high capacity for adaptation to different environmental conditions.

Ecologically, species of *Aleuria* play an important role as saprophytes, contributing to the decomposition of organic matter and nutrient cycling in terrestrial ecosystems. Their occurrence is commonly associated with nutrient-rich soils and environments subjected to disturbance, where organic material is readily available.

From a biotechnological perspective, ascomycete fungi, including species of *Aleuria*, have been recognized for their ability to produce bioactive secondary metabolites. These include compounds with antioxidant and antimicrobial properties, as well as natural pigments with potential applications in the pharmaceutical, cosmetic, and food industries (SILVA-FILHO *et al*., 2020; SILVA & MORAES, 2020).

Additionally, some species related to this group have been reported to produce lectins of biotechnological interest, such as *Aleuria aurantia* lectin (AAL), widely used in glycobiology and biomedical research due to its specificity for fucose-containing glycans (SANDOVAL *et al*., 2021).

In the Upper Solimões region, studies on fungi of this genus remain limited, despite environmental conditions indicating a high potential for their occurrence. Therefore, research focused on the identification and characterization of *Aleuria* species is essential to expand knowledge of fungal biodiversity and to explore their ecological and biotechnological potential in the Amazon (COSTA & NASCIMENTO, 2022).

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 22/04/2026
Vol: 13.07
DOI: 10.66104/59ets318
Pages: 1-20

3. MATERIALS AND METHODS

3.1 Study area and sample collection:

Macrofungi were collected in an urban area of the municipality of Tabatinga, Amazonas, Brazil (04°14'21.5" S; 69°56'32.7" W), located in the tri-border region between Brazil, Colombia, and Peru, in September 2025.

A total of three macrofungal specimens morphologically compatible with *D. spathularia* and two specimens compatible with *Aleuria* sp. were collected. The specimens were aseptically collected using sterilized spatulas, placed in ventilated containers to prevent moisture accumulation, and transported to the laboratory for subsequent morphological analysis and fungal isolation procedures.

3.2 Identification of Macrofungi

Preliminary identification of macrofungi was performed based on macromorphological characteristics of the fruiting bodies, including shape, color, and substrate. Digital image recognition tools (e.g., Google Lens) were used as a complementary approach for rapid comparison with online databases.

The identification was further supported by comparison with specialized mycological literature (WATANABE, 2010; SIQUEIRA et al., 2018; VISAGIE et al., 2021).

The taxonomic identification presented in this study is based solely on morphological characteristics and should therefore be considered preliminary, requiring molecular analyses for definitive confirmation.

3.3 Isolation and cultivation of fungal strains

Fungal isolation was carried out on potato dextrose agar (PDA) medium following adapted protocols (BARNETT & HUNTER, 1998; DEACON, 2013).

The samples were initially cleaned to remove surface debris and subsequently subjected to surface sterilization through sequential immersion in 70% ethanol, sodium hypochlorite solution, and sterile distilled water. From each specimen, three internal fragments were aseptically excised and inoculated in triplicate onto PDA, resulting in a total of 15 fragments and 45 culture plates.

REMUNOM
ISSN 2178-6925
Received: 13/01/2026 - **Accepted:** 22/04/2026
Vol: 13.07
DOI: 10.66104/59ets318
Pages: 1-20

Following incubation, six morphologically distinct fungal isolates (F1–F6) were obtained based on observable differences in colony color, texture, growth pattern, and radial expansion.

The cultures were incubated at 28 °C for seven days under controlled conditions, with daily monitoring of mycelial development. Actively growing colonies were periodically subcultured onto fresh PDA plates to obtain pure isolates.

3.4 Purification and preservation of strains

Purification was performed through successive subculturing until homogeneous growth and absence of contamination were observed.

The purified strains were preserved under refrigeration (4 °C) and, for long-term storage, in cryotubes containing 20% glycerol at −20 °C (WATANABE, 2010; CASTRO & BERMEO, 2021).

3.5 Micromorphological characterization

Morphological characterization was performed based on both macroscopic and microscopic analyses of colonies grown on PDA medium. Colony characteristics such as color, texture, and growth pattern were recorded.

Microscopic observations were conducted using lactophenol cotton blue staining to visualize hyphae and reproductive structures, following standard mycological procedures (SAXENA & GUPTA, 2019; SILVA et al., 2022).

4. RESULTS AND DISCUSSION

4.1 Characteristics of the Collection Site

The collection site corresponds to the surface of a metal roof composed of oxidized zinc, located in an urban environment in the municipality of Tabatinga, Amazonas. The area is characterized by the absence of vegetation cover, direct exposure to climatic conditions, and the accumulation of various waste materials, including paper, wood fragments, plastics, metals, and decomposing organic matter.

REMUNOM
ISSN 2178-6925
Received: 13/01/2026 - **Accepted:** 22/04/2026
Vol: 13.07
DOI: 10.66104/59ets318
Pages: 1-20

This environment is subject to typical Amazonian climatic conditions, such as high temperatures, intense solar radiation, and frequent rainfall. The alternation between high humidity and periods of drying promotes the decomposition of organic matter and creates favorable conditions for the development of saprophytic fungi.

Despite the absence of vegetation, the accumulation of organic residues contributes to the formation of microhabitats with increased moisture retention and partial thermal insulation, which favor fungal colonization. Similar environments have been reported as suitable for opportunistic fungi capable of degrading cellulosic and lignocellulosic substrates (BARBERÁN *et al*., 2021; MENDOZA *et al*., 2021).

The presence of diverse organic substrates, associated with anthropogenic activity and improper waste disposal, provides a continuous supply of nutrients for fungal growth. These conditions are consistent with studies indicating that fungal diversity is strongly influenced by substrate availability and environmental factors (MUELLER & BILLINGS, 2019).

Therefore, the studied site represents a relevant urban microenvironment for investigating macrofungal occurrence under anthropogenic influence, contributing to the understanding of fungal ecology in Amazonian urban contexts.

4.2 Dacryopinax spathularia and *Aleuria* sp.

The collected macrofungi were preliminarily classified as morphotypes compatible with *D. spathularia* and *Aleuria* sp., based on macromorphological characteristics observed in the field and under laboratory observation. Features such as color, shape, and substrate were considered, following descriptions available in specialized mycological literature.

Digital image recognition tools, including Google Lens, were used as a complementary approach to compare the observed specimens with reference images from online databases. Although such tools can assist in rapid classification, they were used only as supportive resources and do not replace traditional taxonomic methods (Wang et al., 2023).

For *D. spathularia*, classification was supported by its characteristic orange coloration and spatulate or fan-shaped basidiomata, typically found growing on

REMUNOM
ISSN 2178-6925
Received: 13/01/2026 - **Accepted:** 22/04/2026
Vol: 13.07
DOI: 10.66104/59ets318
Pages: 1-20

decaying wood. These features are consistent with descriptions reported in the literature for this species (LAESSOE & PETERSEN, 2019; SIQUEIRA *et al*., 2018).

In the case of *Aleuria* sp., recognition was based on the observation of apothecial structures with a cup-shaped morphology and intense orange coloration, commonly associated with this genus. Such characteristics are widely described for ascomycete fungi and support preliminary classification at the genus level (TORTORA *et al*., 2017).

It is important to emphasize that, due to the absence of microscopic or molecular confirmation, the classifications presented in this study should be considered preliminary. Nevertheless, the morphological characteristics observed are consistent with the taxonomic descriptions available in the literature, supporting the proposed preliminary classification, mainly at the genus level where applicable.

The occurrence of *D. spathularia*, typically associated with lignocellulosic substrates, indicates the presence of active decomposition processes in the study area. Similarly, the presence of *Aleuria* sp. suggests the existence of microenvironments with organic matter accumulation and favorable moisture conditions. These findings contribute to understanding the ecological dynamics of macrofungi in urban environments of the Amazon.

4.3 Macromorphological Characteristics of the Obtained Strains

Table 1 summarizes the macromorphological characteristics of the six fungal isolates obtained during cultivation on PDA (Potato Dextrose Agar). The comparison includes parameters such as colony color, texture, diameter, and growth pattern, which are essential for the preliminary differentiation of the isolates and for supporting their morphological characterization.

Table 1: General Characteristics and Morphology of the Isolated Fungal Strains.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 22/04/2026
Vol: 13.07
DOI: 10.66104/59ets318
Pages: 1-20

Isolates	General appearance	Colony color (obverse)	Colony color (reverse)	Texture	Diameter (mm)	Margin	Diffusible pigmentation	Growth pattern	Obverse	Verse
F1	Circular colony, uniform growth	White to light cream; yellowish center	Diffuse light yellow.	Cottony to velvety, dense	60	Regulars	Absent.	Radial and homogeneous		
F2	Circular colony with central pigmentation	Yellowish-green center, white periphery	Yellowish-green center with light halo.	Granular to velvety	20	Regulars	Slight yellow pigmentation	Concentric with zonation		
F3	Dense, thick colony	Homogeneous white with slightly yellowish center.	Light cream, uniform	Cottony, very dense	60	Regular, thick	Absent	Radial with abundant aerial mycelium		
F4	Colony with marked zonation.	Greenish-gray with concentric pattern.	Light yellow with darker zones	Powdery, fine mycelium	Undetermined	Regular, segmented	Possible yellow pigmentation	Concentric with pronounced zonation.		
F5	Small, centrally located colony	White with center yellowish	Intense yellow center	Cottony and dense	18	Regular, slightly raised	Absent	Slow and centralized		

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 22/04/2026
Vol: 13.07
DOI: 10.66104/59ets318
Pages: 1-20

F6	Circular colony with slight zonation	Light cream with yellowish center	Intense yellow center with cream gradient	Thin, velvety, low aerial mycelium	40	Regular	Slight yellow pigmentation	Moderate radial with zonation	

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 13/02/2026
Vol:
DOI:
Pages: 1-25

4.4 Micromorphological Characteristics of Selected Strains

Micromorphological analysis was performed from 18 slides prepared using lactophenol cotton blue mounts; however, only one slide provided satisfactory visualization of fungal structures, corresponding to isolate F4 (Table 1).

The observed hyphae were hyaline, septate, and smooth-walled, exhibiting dichotomous branching, a pattern commonly reported in hyaline anamorphic fungi, including species of *Penicillium* and other members of the order Eurotiales (SAMSON *et al*., 2010; HOUBRAKEN *et al*., 2020). Erect, smooth-walled conidiophores arising perpendicularly from the vegetative mycelium were also observed.

The presence of branched conidiophores, with biverticillate to multiverticillate organization, is consistent with morphological patterns described for *Penicillium* species (VISAGIE *et al*., 2021). At the apex, metulae arranged in whorls supported flask-shaped phialides, forming the typical penicillate structure characteristic of the genus (WATANABE, 2010).

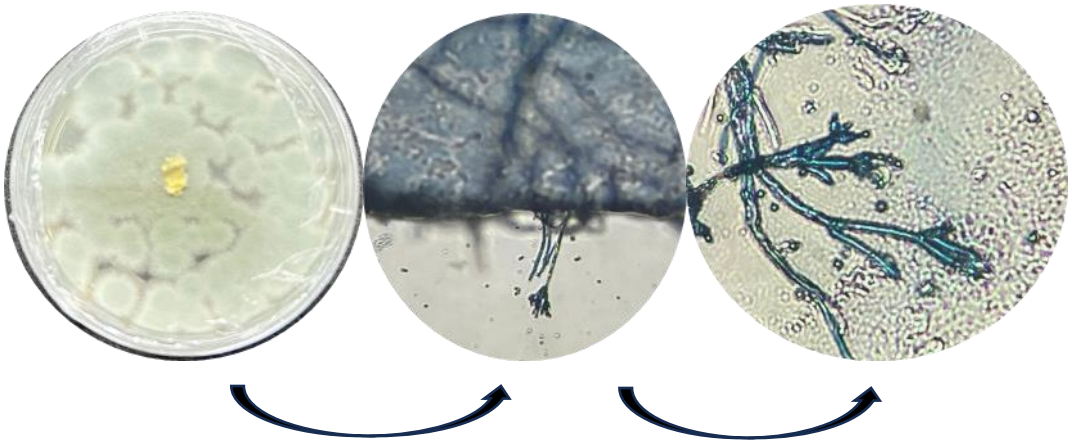
The phialides produced dry chains of globose to subglobose conidia, which were hyaline and apparently smooth. These structures appeared abundant and dispersed in the microscopic field, likely due to slide preparation conditions.

The combination of these morphological features suggests that the isolate belongs to the genus *Penicillium*. However, due to the limited number of successful observations and the absence of molecular analysis, this identification should be considered preliminary. The observed characteristics are consistent with descriptions reported in specialized literature (WATANABE, 2010; SAMSON *et al*., 2010; HOUBRAKEN et al., 2020). Figure 1 illustrates the micromorphological characteristics observed for the *Penicillium* sp. isolate.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 13/02/2026
Vol:
DOI:
Pages: 1-25

Figure 1: Micromorphological Characterization of *Penicillium* sp.



Source: Author 2025.

4.5 Biotechnological Applications of Characterized Strains

The macrofungal specimens morphologically compatible with *D. spathularia* and *Aleuria* sp., exhibited morphological and ecological characteristics consistent with profiles reported for fungi with biotechnological potential. Features such as colony coloration, texture, growth pattern, and reproductive structures suggest possible metabolic capabilities associated with the production of lignocellulolytic enzymes, natural pigments, and other compounds of industrial interest.

In addition to their potential applications, these fungi play a relevant ecological role in the decomposition of organic matter, contributing to nutrient cycling in their environment. Although the present study did not include biochemical or molecular analyses, the observed characteristics indicate that these strains may represent promising candidates for future investigations focused on applied microbiology and biotechnology.

4.6 Biodiversity and Biotechnological Potential of *D. spathularia*

The specimens morphologically compatible with *D. spathularia* are characterized in the literature by its gelatinous basidioma and orange coloration, is widely reported in tropical and subtropical environments as an efficient decomposer

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 13/02/2026
Vol:
DOI:
Pages: 1-25

of wood, sawdust, plant debris, and other lignocellulosic substrates (HIDAYAT *et al*., 2021).

This species is commonly associated with fungal communities inhabiting decaying wood, humid urban environments, areas with accumulated plant residues, and secondary forest ecosystems. Studies indicate that *D. spathularia* frequently coexists with genera such as *Mycena*, *Marasmius*, and *Schizophyllum*, as well as anamorphic fungi involved in rapid cellulose degradation.

Additionally, the literature describes this species as a producer of hydrolytic and oxidative enzymes, including laccases, cellulases, hemicellulases, and peroxidases (PATEL *et al*., 2023). These enzymes are of particular interest for applications in bioremediation, degradation of organic solid waste, and the conversion of plant biomass into second-generation biofuels.

The rapid mycelial growth observed in the isolates obtained in this study is consistent with reports in the literature, which highlight *D. spathularia* as an active lignocellulose degrader within the family Dacrymycetaceae in tropical environments (PITT & HOCKING, 2009).

4.7 Biodiversity and Biotechnological Potential of *Aleuria* sp.

The specimens preliminarily classified as *Aleuria* sp., recognized by its cup-shaped morphology and vibrant coloration, has been reported in a wide range of ecosystems, including urban areas, fertile soils, temperate regions, and forest edges (LIU *et al*., 2019).

The biodiversity associated with this genus is broad and includes communities of soil fungi, saprobic bacteria, actinobacteria, and other decomposer macrofungi involved in nutrient cycling. Studies indicate that *Aleuria* species are capable of producing carotenoids, orange-red pigments, and metabolites with antioxidant and antimicrobial activities, as well as bioactive polysaccharides with pharmacological potential (MOLNÁR *et al*., 2020).

In addition, some species—particularly *Aleuria aurantia*—are known to synthesize Aleuria aurantia lectin (AAL), a compound widely applied in glycobiology,

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 13/02/2026
Vol:
DOI:
Pages: 1-25

cancer diagnostics, glycan research, and molecular biotechnology (SANDOVAL *et al*., 2021).

The morphological profile observed in the isolates obtained in this study is consistent with species reported to produce such compounds. However, further biochemical analyses are required to confirm the production of lectins and pigments under in vitro conditions.

4.8 Biotechnological Potential of the Genus *Penicillium*

Although this study focused primarily on macrofungi, one of the isolates analyzed microscopically exhibited structures typical of *Penicillium* sp., including biverticillate conidiophores, metulae, and phialides forming a well-defined penicillus.

The genus *Penicillium* plays a fundamental role in microbial biodiversity in both urban and natural environments, contributing to the decomposition of organic matter, nutrient recycling, and microbial interactions (WATANABE, 2010). In environments such as the collection site—characterized by the presence of paper, wood, food residues, and high humidity—the occurrence of *Penicillium* species is commonly associated with primary decomposition processes.

From a biotechnological perspective, *Penicillium* species are widely recognized for their ability to produce extracellular enzymes, such as pectinases, cellulases, and lipases, as well as a variety of secondary metabolites, including antibiotics (e.g., penicillin), organic acids, pigments, and, in some cases, mycotoxins. These fungi are also applied in industrial fermentation processes and in bioremediation due to their capacity to degrade complex and xenobiotic compounds (HOUBRAKEN *et al*., 2020).

Therefore, the presence of *Penicillium* sp. at the investigated site is consistent with the ecological characteristics of the environment and adds value to the mycological diversity observed, expanding the potential biotechnological relevance of the isolates obtained.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 13/02/2026
Vol:
DOI:
Pages: 1-25

5. Conclusion

This study provides a preliminary assessment of cultivable fungi associated with macrofungal specimens morphologically compatible with *D. spathularia* and *Aleuria* sp. in an urban environment in Tabatinga, Amazonas. The results demonstrate that anthropogenic environments can support diverse fungal communities involved in organic matter decomposition.

Six distinct fungal morphotypes were isolated, and one isolate was preliminarily assigned to *Penicillium* sp. based on micromorphological characteristics. However, as the identifications were based solely on morphological criteria, they should be considered provisional.

Although the isolates may present potential biotechnological relevance, such as the production of enzymes and bioactive compounds, these applications remain hypothetical. Further studies involving molecular identification and biochemical analyses are necessary to confirm their taxonomic identity and functional potential.

6. Bibliographic References

ALMEIDA, J. P.; LIMA, F. S.; CORRÊA, R. L. Dacryopinax spathularia: morphological aspects and industrial applications**. Amazonian Journal of Biotechnology**, v. 7, n. 2, p. 45–58, 2019.

BARBERÁN**, A.** *et al.* Urban fungal diversity and environmental gradients. **Environmental Microbiology**, v. 23, n. 1, p. 432–447, 2021.

BARBOSA, T. A.; SOUZA, C. Q.; ALMEIDA, M. A. Urban mycobiota: diversity and ecological roles of fungi in anthropogenic environments. **Science of the Total Environment**, v. 780, p. 146580, 2021.

BARNETT, H. L.; HUNTER, B. B. **Illustrated genera of imperfect fungi**. 4. ed. Minneapolis: APS Press, 1998.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 13/02/2026
Vol:
DOI:
Pages: 1-25

BLACKWELL, M. The fungi: 1.5 million species? **American Journal of Botany**, v. 98, n. 3, p. 426–438, 2011.

CARVALHO, E. M.; MENDES, D. F. Macrofungi with biotechnological potential in the Amazon. **Brazilian Journal of Mycology**, v. 6, p. 60–72, 2022.

CASTRO-RÍOS, C.; BERMEO-ESCOBAR, J. Conservation methods and morphological characterization of filamentous fungi. **Revista Colombiana de Biología Fúngica**, v. 15, n. 2, p. 101–113, 2021.

CHEANG, D. *et al***.** Whole genome sequencing of *Dacryopinax spathularia* reveals pathways for glycolipid biosynthesis. Hong Kong: **Biodiversity Genomics Consortium**, 2024.

COSTA, R.; NASCIMENTO, A. **Fungal biodiversity in urban substrates**. [S. l.: s. n.], 2022.

CRUZ-MENDOZA, J. *et al.* Urban macrofungal diversity in Latin America: patterns and ecological determinants. **Journal of Urban Ecology**, v. 7, p. 1–15, 2021.

DEACON, J. W. **Fungal biology**. 4. ed. Malden: Blackwell Publishing, 2013.

FONSECA, A. **Illustrated guide to saprobic fungi**. São Paulo: Micológica Publishing House, 2019.

GOMES, L. *et al*. **Evaluation of Amazonian macrofungi**. 2023.

HIDAYAT, I. *et al*. **Enzymatic potential of jelly fungi for lignocellulosic bioconversion**. 2021.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 13/02/2026
Vol:
DOI:
Pages: 1-25

HOUBRAKEN, J. *et al*. Advances in *Penicillium* taxonomy. *Studies in Mycology*, v. 95, p. 1–59, 2020.

LÆSSØE, T.; PETERSEN, J. Systematics of agaricoid fungi (*Aleuria* and related taxa). [S. l.: s. n.], 2019.

LIMA, R. N. *et al*. Diversity and ecology of macrofungi in Amazonian urban environments. **Revista Amazônica de Ciências Ambientais**, v. 12, p. 55–70, 2022.

LIU, X. *et al*. Carotenoid production in Ascomycota macrofungi. **Fungal Biology Reviews**, v. 33, p. 145–159, 2019.

LÓPEZ-QUINTERO, C. A. *et al*. Protocols for fungal biodiversity assessments. **Mycological Progress**, v. 18, p. 1203–1219, 2019.

MOLNÁR, Z. *et al*. Bioactive metabolites from cup fungi. **Applied Microbiology and Biotechnology**, v. 104, p. 7897–7912, 2020.

MUELLER, G. M.; BILLINGS, S. A. Fungal diversity in the Neotropics: an overview. **Mycology,** v. 111, n. 3, p. 345–360, 2019.

NAGY, L. G. *et al*. Advances in fungal phylogeny. **Fungal Biology Reviews**, v. 31, p. 199–210, 2017.

NEVES, M. A.; BASEIA, I. G. Neotropical macrofungi diversity: an updated review. **Mycological Progress**, v. 16, p. 915–928, 2017.

OLIVEIRA, D. S.; MARTINS, R. P.; GONÇALVES, L. R. Preservation techniques for filamentous fungi in culture collections. **Revista de Micologia Aplicada**, v. 8, n. 2, p. 33–40, 2020.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 13/02/2026
Vol:
DOI:
Pages: 1-25

PATEL, Y. *et al*. Laccase and cellulase production in jelly fungi. **Bioresource Technology Reports**, v. 22, p. 101–118, 2023.

PEREIRA, L. M.; SOUZA, R. A. Bioeconomy and Amazonian macrofungi. **Revista de Ciências Naturais da Amazônia**, v. 11, n. 3, p. 135–147, 2020.

PITT, J. I.; HOCKING, A. D. **Fungi and food spoilage**. 3. ed. New York: Springer, 2009.

RIBEIRO, F. A.; SILVA, A. C.; MOURA, J. P. Purification and conservation of Amazonian fungal cultures. **Biotechnology and Environment Journal**, v. 10, n. 1, p. 77–85, 2021.

SANDOVAL-CRUZ, M. *et al*. Applications of *Aleuria aurantia* lectin in biomedical sciences. *Glycobiology*, 2021.

SAXENA, M.; GUPTA, R. Morphological identification of filamentous fungi. *Mycology Today*, v. 18, n. 4, p. 201–215, 2019.

SILVA, A. F.; MORAES, E. J. Fungal biodiversity in the Amazon. *Estudos Amazônicos*, v. 15, n. 2, p. 43–57, 2020.

SILVA-FILHO, A. F. *et al*. Diversity of macrofungi in tropical forests: patterns and drivers. *Mycosphere*, v. 11, n. 1, p. 1–15, 2020.

SILVA, L. M.; SANTOS, D. C.; PEREIRA, H. G. Contemporary methods of micromorphological characterization. **MycoScience Brasil**, v. 13, n. 1, p. 50–63, 2022.

SIQUEIRA, L. *et al*. **Manual of environmental mycology**. [S. l.: s. n.], 2018.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 13/02/2026
Vol:
DOI:
Pages: 1-25

TEDERSOO, L. *et al*. Global diversity and geography of soil fungi. **Science**, v. 346, p. 1256688, 2014.

TORTORA, G. J.; FUNKE, B. R.; CASE, C. L. ***Microbiology*****.** 12. ed. Porto Alegre: Artmed, 2017.

VISAGIE, C. *et al*. Modern *Penicillium* taxonomy using polyphasic approaches. **Studies in Mycology**, v. 99, p. 35–70, 2021.

WANG, Y. *et al*. Lignocellulose degradation in saprobic fungi. **Mycological Progress**, 2023.

WATANABE, T. **Pictorial atlas of soil and seed fungi**. 3. ed. Boca Raton: CRC Press, 2010.

ZHANG, J. *et al*. Lignocellulose degradation and fungal enzymes: a comprehensive review. **Biotechnology Advances**, v. 49, p. 107736, 2021.