ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
Volume 2 Issue 3 (March 2026)

Isolation and Characterization of Endophytic Fungi from Selected Agricultural Crops of Lake Sebu, South Cotabato

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Date Submitted:
February 15, 2026

Date Accepted:
March 1, 2026

Date Published:
March 19, 2026

DOI:
10.5281/zenodo.19121514

ABSTRACT

This study aimed to isolate and characterize endophytic fungi from selected agricultural crops in Lake Sebu, South Cotabato. Agriculture is vital in the area but faces challenges such as pest infestation, plant diseases, and soil degradation. To address these problems, researchers focused on endophytic fungi—microorganisms that inhabit plant tissues and promote plant growth and resistance. The selected crops were bell pepper, coconut, cassava, rice, corn, papaya, soybean, eggplant, and tomato, chosen because they are the most commonly cultivated crops in Lake Sebu. Leaf samples were collected, surface-sterilized, and cultured on Potato Dextrose Agar (PDA). The isolated fungi showed beneficial traits such as fast growth and resistance to contamination, while some displayed harmful traits like irregular margins and pigmentation. Several isolates were preliminarily identified as belonging to the genera Aspergillus, Trichoderma, Cladosporium, Fusarium, and Penicillium. The study highlights the potential of beneficial endophytic fungi to promote sustainable agriculture by serving as natural biocontrol agents and plant growth enhancers, reducing dependence on chemical fertilizers and pesticides.

Keywords: *Endophytic fungi, Isolation, Morphological characterization, Agricultural crops, Lake Sebu, South Cotabato*

ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
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INTRODUCTION

Agriculture plays a fundamental role in the economic and social fabric of the Philippines, serving as a primary source of livelihood for a substantial portion of the population, particularly in rural areas. In provinces such as South Cotabato—especially in the municipality of Lake Sebu—farming is not only a means of income but also a key contributor to local food production and regional economic resilience. The success and sustainability of agricultural activities in these areas are crucial for ensuring food security and supporting the well-being of farming communities.

Despite its importance, the agricultural sector in the Philippines faces a range of persistent and emerging challenges. Among the most pressing issues are pest outbreaks, the spread of plant diseases, and the gradual decline in soil fertility due to overuse and environmental degradation. These factors collectively threaten crop productivity and, by extension, the livelihoods of smallholder farmers who often lack access to advanced agricultural technologies or resources.

In light of these challenges, there is a growing need to explore sustainable and environmentally friendly solutions that can enhance crop resilience and improve yields. One promising area of research lies in the use of beneficial microorganisms, particularly endophytic fungi, which live within plant tissues without causing harm. These microorganisms have shown potential in promoting plant growth, enhancing resistance to pests and pathogens, and improving nutrient uptake. Investigating the role of endophytic fungi in agricultural systems, especially in ecologically sensitive and economically dependent regions like Lake Sebu, may offer innovative and practical approaches to addressing current agricultural problems while promoting long-term sustainability.

A previous study in the area was undertaken to make an inventory of the upland rice resource base of Lake Sebu, to document traditional farming and seed conservation practices of the T'bolis, and to detect the occurrence of genetic erosion in the farmers' fields. Participatory rural appraisal (PRA) techniques were the methods used in the study. Results revealed a very high level of genetic diversity (136 landraces) of traditional upland rice cultivars in the area. Seed movement was also unrestricted in the area for most of the sitios. The system of cultivation in the area, however, is done at the subsistence level and is purposely geared towards domestic consumption. No effort is also exerted with respect to the conservation of the rice resource and it is made possible through continued utilization. For the T'bolis in Lake Sebu, the availability of planting materials does not warrant conservation. Genetic erosion therefore occurs in farmers' fields and traditional varieties are lost on a continuous basis. Unless mitigating measures are done to save the upland ecosystem, these valuable genetic resources will be irreversibly lost (Lasalita-Zapico, F., Martin, T. T., Pena, R. J., & Gonzales, J. 2008).

Endophytic fungi are found in most, if not all, plant species on the planet. They colonize inner plant tissues without causing symptoms of disease, thus providing benefits to the host plant while also benefiting from this interaction. The global concern for the development of more sustainable agriculture has increased in recent years, and research has been performed to decipher ecology and explore the potential of endophytic interactions in plant growth. To date, many studies point to the positive aspects of endophytic colonization, and in this review, such research is summarized based on the direct (acquisition of nutrients and phytohormone production) and indirect (induced resistance, production of antibiotics and secondary metabolites, production of siderophores and protection from abiotic and biotic stresses) benefits of endophytic colonisation. An in-depth discussion of the mechanisms is also presented (Baron, N. C., & Rigobelo, E. C. 2022).

The yield and quality of cultivated food crops are frequently compromised by the prevalent threat from fungal pathogens that can cause widespread damage in both the pre-harvest and post-harvest stages. This paper investigates the challenges posed by fungal pathogens to the sustainability and yield of essential food crops, leading to significant economic and food security repercussions. The paper critiques the long-standing reliance on synthetic fungicides, emphasizing the environmental and health concerns arising from their widespread and occasionally inappropriate use. In response, the paper explores the potential of biological control agents, specifically endophytic fungi, in advancing sustainable agricultural practices. Through their diverse symbiotic relationships with host plants, these fungi exhibit strong antagonistic capabilities against phytopathogenic fungi by producing various bioactive compounds and promoting plant growth. The review elaborates on the direct and indirect mechanisms of endophytic antagonism, such as antibiosis, mycoparasitism, induction of host resistance, and competition for resources, which collectively contribute to inhibiting pathogenic fungal growth. This paper consolidates the crucial role of endophytic fungi, i.e., Acremonium, Alternaria, Arthrinium, Aspergillus, Botryosphaeria, Chaetomium, Cladosporium, Cevidencealdinia, Epicoccum, Fusarium, Gliocladium, Muscodor, Nigrospora, Paecilomyces, Penicillium, Phomopsis, Pichia, Pochonia, Pythium, Ramichloridium, Rosellinia, Talaromyces, Trichoderma, Verticillium, Wickerhamomyces, and Xylaria, in biological control, supported by the evidence drawn from more than 200 research publications. The paper pays particular attention to Muscodor, Penicillium, and Trichoderma as prominent antagonists. It also emphasizes the need for future genetic-level research to enhance the application of endophytes in biocontrol strategies aiming to highlight the importance of endophytic fungi in facilitating the transition towards more sustainable and environmentally friendly agricultural systems (Manathunga, K. K., Gunasekara, N. W., Meegahakumbura, M. K., Ratnaweera, P. B., Faraj, T. K., & Wanasinghe, D. N. 2024).

The diversity of endophytic fungi and their potential uses in agricultural crops in Lake Sebu, South Cotabato, remain largely unstudied. This gap in localized research limits the creation of targeted biotechnological approaches for promoting sustainable agriculture in the region.

Objectives of the Study

The general objective of the study was to isolate and characterize the endophytic fungi residing within selected agricultural crops of Lake Sebu, South Cotabato. Specifically, it aimed to:

1. Isolate endophytic fungi from the leaves of selected agricultural crops in Lake Sebu, South Cotabato.
2. Describe the macroscopic and microscopic morphological characteristics of the isolated endophytic fungal strains.

3. Determine the diversity and richness of endophytic fungal communities in the selected agricultural crops.
4. Identify the isolated endophytic fungi up to the genus level.

METHODOLOGY

This section outlines the methods and procedures that were used in conducting the study on the isolation and characterization of endophytic fungi from selected agricultural crops in Lake Sebu, South Cotabato. It details the research design, the study area, the selection of crop samples, and the sampling techniques employed. The chapter also describes the procedures for sample collection, fungal isolation, morphological examination, and molecular identification using ITS region sequencing. Research instruments, laboratory protocols, and steps taken to ensure the reliability and accuracy of results are thoroughly explained. Additionally, the statistical tools for data analysis and the ethical considerations relevant to biological research are presented. Each component of the methodology is discussed comprehensively to provide a clear understanding of how the study was implemented and how its objectives were achieved.

Research Design

This study utilized an exploratory descriptive research design to isolate and characterize endophytic fungi present in selected agricultural crops cultivated in Lake Sebu, South Cotabato. By collecting plant tissue samples and subjecting them to both morphological and molecular analyses, the study aimed to document the diversity of endophytic fungi and identify the species associated with commonly grown crops such as rice, corn, and vegetables. This design was suitable as it allowed for systematic observation, classification, and identification of microbial species within plant tissues, forming a scientific basis for future functional or applied research.

An exploratory descriptive approach is commonly used in microbiological and ecological studies where the primary objective is to document and understand naturally occurring organisms within a specific context. According to Miri and Dehdashti Shahrokh (2019), descriptive research provides essential insights into phenomena by examining patterns, distributions, and characteristics within a given environment. Similarly, ScienceDirect Topics (2016) emphasizes that exploratory studies help establish foundational knowledge by identifying key traits and relationships, often serving as a springboard for hypothesis generation and further experimentation. In this context, the methodology allowed the researchers to uncover the range of fungal endophytes inhabiting agricultural crops in Lake Sebu, contributing to microbial biodiversity records and informing potential future applications in sustainable agriculture.

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Figure 1. Research Design

ISSN: 3116-3475
International Journal
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Research Locale

This study took place in Lake Sebu, a municipality in South Cotabato province, Philippines. Known for its rich agricultural tradition, farming serves as a primary livelihood for the local indigenous groups, particularly the T'boli community. The region's distinctive upland ecosystem supports the cultivation of various crops such as rice, corn, and several types of vegetables, which are commonly grown both for local consumption and market trade.

Figure 2. Map of the Locale of the Study

Population and Sampling

The population for this study comprised agricultural crops commonly cultivated in Lake Sebu, South Cotabato. These crops included rice, corn, and various locally grown vegetables that are widely consumed and integral to the livelihoods of the local farming communities, including indigenous groups such as the T'boli.

A purposive sampling method was employed to select the specific crops and sampling sites. This approach allowed for the deliberate selection of crops that are prevalent in the area and representative of the typical agricultural practices in Lake Sebu. Sampling sites included farms managed by small-scale farmers and indigenous cultivators to capture a diverse range of crop samples.

Data Collection Methods

The data collection process for this study involved both field sampling and laboratory analysis to isolate and characterize endophytic fungi from selected agricultural crops.

Sample Collection. Healthy plant parts, including leaves, stems, and roots, were gathered from selected crops like rice, corn, and local vegetables grown in Lake Sebu, South Cotabato. The samples were carefully harvested using sterilized instruments to avoid contamination. They were then placed in sterile containers or bags and transported to the laboratory under cool conditions to maintain the viability of the fungi.

Surface Sterilization. To isolate only the fungi living inside the plant tissues (endophytic fungi), the samples underwent surface sterilization. This involved a series of washes using ethanol, sodium hypochlorite, and sterile distilled water to eliminate any microbes present on the surface.

Isolation of Endophytic Fungi. After sterilization, the plant tissues were cut into small pieces and placed onto Potato Dextrose Agar (PDA) plates or other appropriate growth media. The plates were incubated at controlled temperatures (around 25–28°C) for several days to promote fungal growth.

Purification and Culture. Fungal colonies that developed were observed and transferred onto fresh agar plates to obtain pure cultures. These isolates were maintained for further examination.

Morphological Characterization. The isolated fungi were examined both visually (colony color, texture, growth pattern) and microscopically (spore and hyphae structures) to document their physical characteristics for initial identification.

Data Recording and Analysis. All data, which was limited to morphological observations, were carefully documented. The information was analyzed descriptively to assess the diversity and distribution of endophytic fungi within the sampled crops.

Research Instruments

The following instruments and materials were utilized to carry out the isolation and characterization of endophytic fungi from selected agricultural crops:

1. **Sterile Sampling Tools:**
   Scalpels, pruning shears, forceps, and scissors sterilized using ethanol or an autoclave were used for the careful collection of plant samples (leaves, stems, roots) to prevent contamination.
2. **Sterile Containers and Bags:**
   Plastic bags, test tubes, or sterile containers were used for storing and transporting plant samples from the field to the laboratory under sterile conditions.
3. **Laboratory Media and Reagents:**
   Potato Dextrose Agar (PDA) plates or other suitable fungal culture media for fungal isolation and growth. Chemicals for surface sterilization such as ethanol, sodium hypochlorite (bleach), and sterile distilled water.
4. **Incubator:**
   A laboratory incubator set to a controlled temperature (typically 25–28°C) were used to facilitate fungal growth from the inoculated plant tissues.
5. **Colony Characterization:**
   The morphological observation of fungal structures such as spores and hyphae to aid in preliminary identification. The identification was limited up to the genus level only due to limited laboratory equipment.

Data Gathering Procedure

This study began with the collection of healthy plant samples, including leaves, stems, and roots, from selected agricultural crops such as rice, corn, and local vegetables in Lake Sebu, South Cotabato. Sampling was conducted using sterilized tools to minimize contamination, and samples were carefully placed in sterile containers or bags before being transported to the laboratory under cool conditions to preserve fungal viability. Upon arrival at the laboratory, the plant materials underwent surface sterilization through a sequential washing process using ethanol, sodium hypochlorite, and sterile distilled water to eliminate any surface microorganisms and ensure that only endophytic fungi were isolated. The sterilized plant tissues were then cut into small segments and inoculated onto Potato Dextrose Agar (PDA) plates or other suitable culture media, which were incubated at controlled temperatures of around 25–28°C to promote fungal growth. Emerging fungal colonies were monitored, and pure fungal isolates were obtained through sub-culturing onto fresh media. These isolates underwent detailed morphological examination, including macroscopic observation of colony characteristics and microscopic analysis of spores and hyphae.

Data Analysis

The data from the isolation and characterization of endophytic fungi were analyzed using both qualitative and quantitative methods. Morphological traits and microscopic features were documented for initial identification. Fungal diversity was measured by species richness and frequency across crops. Results were presented in tables and charts, using descriptive statistics to highlight variations. This analysis provided a clear understanding of the fungal community in Lake Sebu's crops, offering valuable baseline data for future research.

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Ethical Considerations

This study followed ethical standards and local regulations by obtaining permission from landowners and authorities before sample collection. It avoided harming the environment or disrupting farming practices. Confidentiality of information from local stakeholders was maintained, and proper lab safety protocols were observed. The research respected the cultural values and traditional knowledge of the indigenous communities, ensuring integrity and transparency throughout.

RESULTS AND DISCUSSIONS

Isolation and Frequency of Endophytic Fungi

A total of 10 agricultural crops from Lake Sebu, South Cotabato, were collected and processed for the isolation of endophytic fungi. Each crop sample consisted of three replicates, with three leaf segments per replicate, resulting in a total of 90 leaf segments incubated on Potato Dextrose Agar (PDA) medium.

After 7 days of incubation at room temperature, fungal growth was observed in 61 segments, yielding an overall colonization frequency (CF) of 67.71% (Table 1). This result indicates that endophytic fungi are commonly present in the leaves of agricultural crops grown in Lake Sebu.

The highest colonization frequencies were recorded in Tomato (Solanum lycopersicum), Papaya (Carica papaya), Rice (Oryza sativa), and Cassava (Manihot esculenta), each with 99.9% CF, suggesting that these crops provide favorable conditions for fungal colonization. In contrast, the lowest CF was observed in Banana (Musa acuminata) with 22.2%, followed by Eggplant (Solanum melongena) with 44.4%.

Differences in colonization frequency among crops may be attributed to factors such as leaf surface structure, nutrient composition, and moisture content, which can influence the entry and establishment of endophytic fungi. Environmental conditions in Lake Sebu—such as high humidity and warm temperature—also promote the growth and survival of these microorganisms.

Table 1. Colonization frequency of endophytic fungi isolated from agricultural cops in Lake Sebu.

Host Crop	Sample Code	No. of Leaf Segment Incubated	No. of Segments Colonized	Colonization Frequency (99.9%)
Bell Pepper (Capsicum annuum)	S1R1	3	2	22.2
	S1R2	3	3	33.3
	S1R3	3	3	33.3

		9	8	88.8
Tomato (Solanum lycopersicum)	S2R1	3	3	33.3
	S2R2	3	3	33.3
	S2R3	3	3	33.3
		9	9	99.9
Papaya (Carica papaya)	S3R1	3	3	33.3
	S3R2	3	3	33.3
	S3R3	3	3	33.3
		9	9	99.9
Rice (Oryza sativa)	S4R1	3	3	33.3
	S4R2	3	3	33.3
	S4R3	3	3	33.3
		9	9	99.9
Casaava (Manihot esculenta Crantz)	S5R1	3	3	33.3
	S5R2	3	3	33.3
	S5R3	3	3	33.3
		9	9	99.9
Corn (Zea mays)	S6R1	3	2	22.2
	S6R2	3	0	0
	S6R3	3	3	33.3
	9	5	55.5	
String Beans (Phaseolus vulgaris)	S7R1	3	2	22.2
	S7R2	3	1	11.1
	S7R3	3	0	0
	9	3	33.3	
Coconut (Cocos nucifera)	S8R1	3	3	33.3
	S8R2	3	0	0
	S8R3	3	0	0
	9	3	33.3	
Banana (Musa acuminata)	S9R1	3	2	22.2
	S9R2	3	0	0
	S9R3	3	0	0
Total	3	2	22.2	
Egg Plant (Solanum melongena)	S10R1	3	1	11.1
	S10R2	3	1	11.1
	S10R3	3	2	22.2
	9	4	44.4	
Total	90	61	67.71	

This table presents the quantitative data on the success rate of isolating endophytic fungi from the leaf tissues of ten different agricultural crops. It provides a detailed breakdown of the isolation process, showing the number of leaf segments incubated per crop sample (three replicates with three segments each, totaling nine segments per crop) and the number of those segments that exhibited fungal growth. The colonization frequency (CF) is calculated per replicate and as a total percentage for each crop species.

The data reveals a high overall colonization frequency of 67.71% across all 90 incubated segments, confirming that endophytic fungi are prevalent inhabitants of these crops. Notably, Tomato, Papaya, Rice, and Cassava each displayed a 99.9% colonization rate, indicating that all leaf segments from these plants hosted endophytic fungi. This suggests these specific crops may provide a particularly favorable niche for fungal endophytes, possibly due to their leaf structure, internal nutrient composition, or the specific micro-environmental conditions they offer. In contrast, Banana (22.2%) and Eggplant (44.4%) showed the lowest colonization frequencies. This variation among different host plants is a common finding in endophyte research, as the relationship between a plant and its endophytic community is influenced by the plant's genetics, physiology, and defense mechanisms. The high humidity and warm climate of Lake Sebu are also likely contributing factors to the overall successful isolation rates observed.

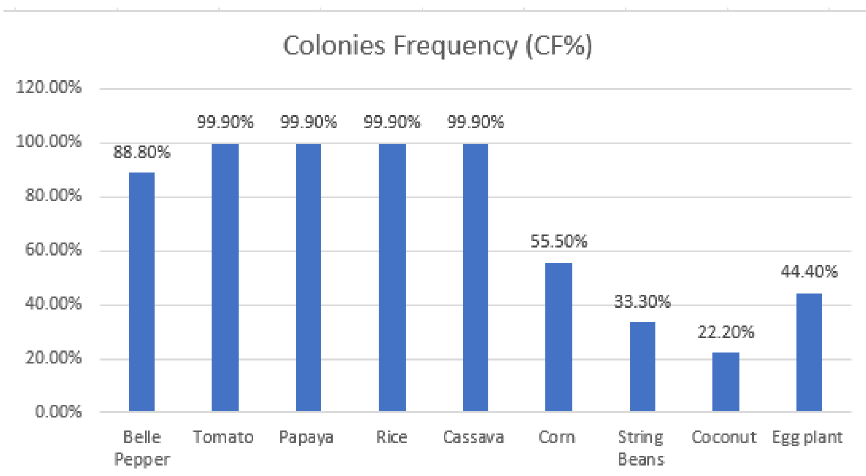

Figure 2. Colonization Frequency (%) of Endophytic Fungi Isolated from Selected Agricultural Crops in Lake Sebu

Figure 2 presents the colonization frequency (%) of endophytic fungi isolated from selected agricultural crops in Lake Sebu, showing clear variation among host plants. The results indicate that tomato, papaya, rice, and cassava all exhibited the highest colonization frequency at 99.90%, suggesting that these crops provide highly favorable environments for endophytic fungal colonization. This may be due to their physiological characteristics, tissue composition, or compatibility with fungal symbionts. Bell pepper also showed a relatively high colonization frequency of 88.80%, indicating strong but slightly lower fungal association compared to the top group.

In contrast, corn showed a moderate colonization frequency of 55.50%, while eggplant had 44.40%, suggesting a reduced but still notable presence of endophytes. The lowest colonization frequencies were observed in string beans (33.30%) and coconut (22.20%), indicating that these plants may be less conducive to endophytic fungal colonization, possibly due to structural defenses, chemical composition, or environmental interactions.

Table 2. Raw Data of Leaf Segments Incubated and Fungal Growth Observed

Sample ID	Host Crop	Segments Incubated	Segments with Fungal Growth	Isolate Codes	Tentative Genus	Remarks
LS1	Bell Pepper (Capsicum annuum)	9	8	S1R1, S1R2, S1R3	Aspergillus, Trichoderma, Fusarium	Fast-growing colonies, pinkish cottony and white fluffy cottony
LS2	Tomato (Solanum lycopersicum)	9	9	S2R1, S2R2, S2R3	Aspergillus, Cladosporiu m	Black colonies with greyish cottony
LS3	Papaya (Carica papaya)	9	9	S3R1, S3R2, S3R3	Aspergillus	White cottony
LS4	Rice (Oryza sativa)	9	9	S4R1, S4R2, S4R3	Aspergillus, Fusarium	Fast-growing colonies, pinkish colony and white cottony
LS5	Casaava (Manihot esculenta Crantz)	9	9	S5R1, S5R2, S5R3	Aspergillus, Cladosporiu m	Yellowish cottony with black colonies
LS6	Corn (Zea mays)	9	5	S6R1, S6R3	Penicillium	White fluffy cottony
LS7	String Beans (Phaseolus vulgaris)	9	3	S7R1, S7R2	Penicillium	White fluffy cottony
LS8	Coconut (Cocos nucifera)	9	3	S8R1	Cladosporiu m	Black colonies with white cottony
LS9	Banana (Musa acuminata)	9	2	S9R1	Cladosporiu m	Black cottonny
LS10	Egg Plant (Solanum melongena)	9	4	S10R1, S10R2, S10R3	Aspergillus	Black colony
TOTAL	**90**	**61**	---	---	---	

ISSN: 3116-3475
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This table serves as a comprehensive inventory of the primary data collected during the isolation phase, linking each crop sample to its corresponding fungal isolates and their preliminary characteristics. For each of the ten crop samples, it lists the sample ID, the number of segments incubated, and the number of segments that yielded fungal growth. Crucially, it assigns isolate codes and provides a tentative genus identification based on initial observations, along with specific remarks on colony morphology.

The table demonstrates that morphologically distinct fungi were isolated from different crops. For instance, isolates from Bell Pepper (LS1) were tentatively identified as Aspergillus, Trichoderma, and Fusarium, noted for their fast-growing and cottony textures. Tomato (LS2) and Cassava (LS5) yielded isolates suggestive of Aspergillus and Cladosporium, characterized by black or yellowish colonies. Coconut (LS8) and Banana (LS9) also produced isolates resembling Cladosporium. This table is significant because it begins to reveal the diversity of endophytic fungal genera present. It suggests that while some genera like Aspergillus are widespread across multiple hosts (e.g., Bell Pepper, Tomato, Rice, Eggplant), others may be more prevalent in specific crops. The remarks column adds valuable context, describing traits like fast growth or specific pigmentations that help differentiate the isolates at a glance and guide further characterization.

Morphological Characterization of Isolates

Macroscopic examinations were performed to describe the morphological characteristics of the isolated endophytic fungi. Each isolate was observed for colony color, texture, margin, and pigmentation (macroscopic).

Table 3. Macroscopic Characteristics of Isolated Endophytic Fungi

Isolated Code	Crop Source	Colony Color	Texture	Growth Rate	Remarks
F1	Belle Paper	White	Cottony	Fast	Common Endophytes
F2	Tomato	White	Cottony	Moderate	Uniform Growth
F3	Papaya	Grayish White	Fluffy	Fast	Distinct Colony
F4	Rice	Black	Powdery	Moderate	Denser Texture
F5	Cassava	White	Cottony	Fast	Common morphology
F6	Corn	Grayish Green	Glanural	Fast	Dense Texture

ISSN: 3116-3475
International Journal
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This table provides a structured, comparative overview of the macroscopic features of six distinct fungal isolates obtained from various crops. For each isolate, it details the crop source, colony color, texture, growth rate, and a general remark. This information forms the basis for preliminary differentiation and classification of the fungi.

The data clearly shows morphological diversity among the isolates. For example, Isolate F4 from Rice is described as having a black, powdery colony with a moderate growth rate, which is distinct from Isolate F6 from Corn, which is grayish-green and granular with a fast growth rate. The textures range from cottony (F1, F2, F5) to fluffy (F3), powdery (F4), and granular (F6). This variety in physical characteristics strongly suggests that the isolates belong to different fungal taxa. The fast growth rate noted for several isolates (F1, F3, F5, F6) is a common trait among many saprophytic and endophytic fungi, allowing them to quickly colonize available substrates. By systematically documenting these observable traits, the table provides a foundational dataset for comparing the isolates and selecting candidates for more in-depth microscopic or molecular analysis, which is necessary for definitive identification.

Preliminary Identification of Endophytic Fungi

The identification of fungal isolates up to the genus level remained inconclusive due to the lack of microscopic analysis. The six isolates (F1–F6) were distinguished only based on their macroscopic colony characteristics, which can provide general clues but are not sufficient for precise taxonomic classification.

Nevertheless, the observed colony colors and textures resembled common characteristics of fungal genera frequently reported as endophytes in agricultural crops, such as Aspergillus, Penicillium, Fusarium, and Cladosporium. These genera are known to occur naturally in tropical environments and can contribute to plant growth promotion and stress tolerance.

Further microscopic and molecular analyses are recommended for accurate identification and confirmation of the isolates.

Summary of Findings

Six morphologically distinct fungal isolates were successfully obtained from ten agricultural crops collected in Lake Sebu, South Cotabato. Although microscopic examination and definitive genus identification were not performed, the macroscopic characteristics of the isolates indicated clear diversity among endophytic fungi. The results suggest that agricultural crops in Lake Sebu harbor various endophytic fungi that potentially play important ecological roles.

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Summary

This study, entitled "Isolation and Characterization of Endophytic Fungi from Selected Agricultural Crops of Lake Sebu, South Cotabato," aimed to isolate and describe the fungal endophytes found in commonly cultivated crops in the area. Ten leaf samples from different agricultural crops were collected, surface-sterilized, and incubated to promote the growth of endophytic fungi. From these samples, six fungal isolates were successfully obtained, each exhibiting distinct colony color, texture, and growth rate. The results revealed that endophytic fungi are indeed present within the internal tissues of agricultural crops in Lake Sebu, suggesting their widespread occurrence in local plant communities.

Due to limited laboratory equipment, only macroscopic characterization was performed. Observations included variations in colony pigmentation, surface texture, and growth patterns, which indicated morphological diversity among the isolates. Microscopic and molecular analyses were not conducted; thus, taxonomic identification up to the genus or species level was not achieved. Despite this limitation, the study was able to provide baseline data on the presence and morphological diversity of endophytic fungi associated with selected crops.

The findings contribute to the growing understanding of fungal endophytes in agricultural systems, particularly in Mindanao. Such fungi may play important roles in plant growth, resistance to stress, and biological control of pathogens. The study also emphasizes the need for further research using advanced methods to fully understand the ecological and agricultural significance of these endophytic fungi.

Conclusion

The study successfully isolated several endophytic fungi from agricultural crops in Lake Sebu, South Cotabato. Although the identification process was limited to macroscopic observation, the presence of morphologically diverse fungal isolates suggests that endophytes are naturally abundant in the plant tissues of the area. These findings confirm that local crops serve as suitable hosts for various fungal endophytes, which may have potential applications in agriculture, biotechnology, and environmental sustainability. However, complete identification and functional analysis of these isolates require further laboratory investigation.

Recommendations

1. Future researchers should perform microscopic and molecular characterization of the isolates to accurately identify them at the genus or species level.
2. Additional samples from different plant parts (roots, stems, and fruits) should be collected to provide a more comprehensive understanding of fungal diversity.
3. It is recommended to assess the bioactive properties of the isolated fungi to explore their potential use in natural product development or plant disease management.

4. Collaborations with research institutions equipped with DNA sequencing or microscopy facilities are encouraged to strengthen future studies.
5. Finally, long-term monitoring of endophytic fungi in Lake Sebu crops can help establish their role in promoting sustainable and resilient agricultural systems.

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