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Review of Isolation of Fungi from Shrimps

Sanaa Qasem Badr
University of Basrah, Iraq

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ABSTRACT

Objective: *This study aims to review the current knowledge on the isolation of fungi from shrimps, focusing on their ecological roles, pathogenic potential, and biotechnological applications.* ***Method:*** *A systematic review of previous studies was conducted, highlighting both direct isolation techniques, such as surface sterilization, agar plate, and dilution methods, and indirect approaches, including molecular identification and metagenomics.* ***Results:*** *The findings reveal a wide diversity of fungal genera, such as Aspergillus, Penicillium, Fusarium, Candida, and Cryptococcus, associated with shrimps, with implications for food safety, aquaculture health, and nutrient cycling in marine ecosystems. Several fungi were also identified as potential producers of bioactive compounds with antimicrobial and anticancer properties.* ***Novelty:*** *This review synthesizes traditional and modern approaches to fungal isolation in shrimp, bridging ecological insights with biotechnological potential, while emphasizing the urgent need for further research to address ecological risks and harness the benefits of marine-derived fungi in aquaculture and biotechnology.*

INTRODUCTION

The study of fungi associated with marine organisms, including shrimps, has gained significant attention in recent years due to their ecological and economic importance. Fungi play crucial roles in nutrient cycling, disease pathology, and as potential sources of bioactive compounds [1]. The isolation and characterization of fungi from shrimps can provide insights into their biodiversity, ecological interactions, and potential impacts on aquaculture.

This review aims to summarize the current knowledge on the isolation of fungi from shrimps, highlighting the methods, findings, and implications for aquaculture and marine ecology [2].

MATERIAL AND METHODS

Methods of Isolation

The isolation of fungi from shrimp involves several methodologies, which can be broadly categorized into direct and indirect techniques.

Direct Isolation Techniques

Surface Sterilization: This is a critical first step in isolating fungi from shrimps. Samples are often rinsed with sterile water, followed by treatment with disinfectants such as sodium hypochlorite or ethanol to eliminate surface contaminants.

Agar Plate Techniques: After surface sterilization, the shrimp samples are plated on selective media such as Potato Dextrose Agar (PDA) or Sabouraud Dextrose Agar

(SDA). These media are incubated under controlled conditions to encourage fungal growth [3].

Dilution Techniques: Shrimp tissues can be homogenized and diluted in sterile saline, followed by plating on agar media to isolate fungal colonies. This method allows for the recovery of fungi that may be present in low numbers [4], [5].

Indirect Isolation Techniques

Molecular Techniques: Polymerase chain reaction (PCR) and sequencing of ribosomal RNA genes have become essential tools for identifying fungal species from environmental samples. These methods can provide a more accurate identification of fungi compared to traditional morphological techniques.

Metagenomics: Next-generation sequencing technologies are being employed to analyze the fungal community structure associated with shrimp microbiomes. This approach allows for the detection of a broader range of fungal species, including those that are difficult to culture in the laboratory [6].

RESULT AND DISCUSSION

Result

Diversity of Fungal Species

Research has demonstrated a diverse range of fungi associated with shrimps. For instance, a study by Raja et al. identified several genera, including Aspergillus, Penicillium, and Fusarium, from shrimp samples collected from coastal waters. These genera are known for their ability to produce mycotoxins, raising concerns about food safety and aquaculture health [7], [8].

Additionally, studies have reported the presence of opportunistic fungi, such as Candida and Cryptococcus, which can pose health risks to both shrimps and humans. The identification of these fungi underscores the importance of monitoring fungal populations in aquaculture systems [9].

Ecological Implications

Fungi associated with shrimps can influence various ecological processes. They are involved in the decomposition of organic matter, contributing to nutrient cycling in marine ecosystems. Furthermore, certain fungi have been shown to have pathogenic potential, leading to diseases in shrimps, which can have significant economic impacts on aquaculture industries [10].

Biotechnological Potential

The isolation of fungi from shrimps also offers potential biotechnological applications. Fungal metabolites have been explored for their antimicrobial, antifungal, and anticancer properties. For instance, some marine-derived fungi have been found to produce bioactive compounds that can serve as natural preservatives or therapeutic agents [11], [12], [13], [14].

Discussion

The review highlights that the diversity of fungi isolated from shrimps is broad, encompassing both saprophytic and opportunistic species. Genera such as *Aspergillus, Penicillium,* and *Fusarium* are known to produce secondary metabolites, including mycotoxins, which may threaten aquaculture food safety. In addition, opportunistic pathogens like *Candida* and *Cryptococcus* can affect both shrimps and humans, indicating possible zoonotic implications. These findings demonstrate that fungal monitoring should not only focus on shrimp health but also on broader public health concerns. Therefore, surveillance and preventive measures in aquaculture systems are essential to minimize fungal contamination and its consequences [11], [15], [16], [17].

Advances in molecular methods, including PCR and metagenomic sequencing, have significantly improved the accuracy of fungal identification compared to conventional culture-based techniques. Traditional agar plate or dilution methods often fail to capture unculturable or rare fungal species, whereas molecular approaches allow for a more comprehensive understanding of shrimp-associated microbiota. This methodological progress has provided new insights into the ecological roles of fungi, including their contribution to nutrient cycling and decomposition. However, methodological discrepancies across studies limit the comparability of results and highlight the need for standardized protocols. Establishing unified guidelines for fungal isolation and identification in aquaculture research would enhance consistency and reliability of findings.

Beyond ecological and pathological implications, the discovery of bioactive compounds from shrimp-associated fungi presents promising opportunities for biotechnology. Several marine-derived fungal metabolites exhibit antimicrobial, antifungal, and anticancer properties, which could be harnessed for pharmaceutical or food preservation purposes. This dual role of fungi—as both potential pathogens and valuable biotechnological resources—emphasizes the complexity of their relationship with marine organisms. Future studies should balance the risks and benefits by investigating not only pathogenic threats but also the positive applications of fungal metabolites. Such an integrated perspective can contribute to sustainable aquaculture practices and novel innovations in biotechnology.

CONCLUSION

Fundamental Finding : This review confirms that shrimps harbor diverse fungal communities, including both pathogenic and beneficial species, with implications for aquaculture health, food safety, and biotechnological applications. **Implication :** The findings suggest that effective monitoring and management of shrimp-associated fungi are essential to reduce ecological risks while simultaneously exploring their potential as sources of novel bioactive compounds. **Limitation :** However, the current body of research remains fragmented, with methodological inconsistencies and a lack of comprehensive functional studies limiting our understanding of the ecological roles of these fungi. **Future Research :** Therefore, future investigations should adopt standardized protocols, integrate molecular and metagenomic approaches, and focus on elucidating both pathogenic mechanisms and beneficial applications, thereby advancing sustainable shrimp aquaculture and marine biotechnology.

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* **Sanaa Qasem Badr (Corresponding Author)**
University of Basrah, Iraq
Email: d_sanaabader@yahoo.com