

Antibacterial Activity of Arctic Fungus, *Penicillium samsonianum* Against Methicillin-Resistant *Staphylococcus aureus* (MRSA) and *Staphylococcus haemolyticus*

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Structured Abstract

Background: Antimicrobial resistance (AMR) has been a severe global health problem due to infections caused by multidrug-resistant (MDR) bacteria that are increasingly significant to mortality and morbidity. Over the years, the infections have become increasingly resistant to treatment. This situation led to an urgent exploration of novel antimicrobial compounds derived from natural sources, specifically from psychrophilic fungi, which have historically been a rich source of bioactive molecules. Arctic fungi are known for their extreme environment and unique microbial diversity. This study focuses on the microbial potential of Arctic fungi *Penicillium samsonianum*, which was isolated from Svalbard Island, Norway.

Methods: This research aims to evaluate the antibacterial activity of crude extracts from *P. samsonianum* and determine the MIC and MBC values of the crude extracts against Methicillin-Resistant *Staphylococcus aureus* (MRSA) (ATCC 43300) and *Staphylococcus haemolyticus* (ATCC 29970). The fungus was fermented in potato dextrose broth for 28 days at 10°C, followed by liquid-liquid extraction using ethyl acetate. The crude extract was then subjected to antibacterial assays using the disc diffusion and microdilution methods.

Results: The crude extract of *P. samsonianum* demonstrated promising bioactivities against MRSA ATCC 43300 and *S. haemolyticus* (ATCC 29970) with inhibition zones of 24.66 mm and 33.67 mm, respectively. The MIC values for MRSA and are 0.469 µg/mL and 0.6671 µg/mL for *S. respectively*. The extract demonstrated a bacteriostatic effect against both bacterial strains as determined by MBC/MIC ratio.

Conclusion: This study highlights the potential of *P. samsonianum* isolated from the Arctic environment as a promising source of antibacterial compounds. These findings support the continued exploration of psychrophilic fungi from extreme environments as sources of novel bioactive metabolites to combat antimicrobial resistance.

Keywords: Arctic fungus, antimicrobial-resistance, multidrug-resistant, psychrophilic fungi, *Penicillium samsonianum*

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