

Mycoremediation of Oxytetracycline Marine Fungi from Sponges and Brown Algae of Mauritius

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Description

When bacteria, viruses, fungi, and parasites change over time and no longer respond to medicines making infections harder to treat and increasing the risk of disease spread, severe illness, and death," is how antimicrobial resistance is defined. As the commonly used antibiotics become less effective, bacteria that are resistant to antibiotics pose a threat to the global health sector. Antibiotic overuse or misuse, poor infection prevention and control, diagnosis delaying, and a lack of medicines are the root causes of antimicrobial resistance. As a result, new antimicrobial research is essential. Antimicrobial compounds have long been searched for in the marine environment. Bioactive metabolites containing antimicrobial, antiviral, anticancer, anti-inflammatory, and anti-fouling compounds can be found in this. Diverse marine organisms, including corals, algae, and sponges, as well as their symbionts, have been implicated in the discovery of novel antimicrobial compounds. isolated a type of *Penicillium* from *Melophus* sp., a sponge in the islands of Fiji. Against *Enterococcus faecium* that was resistant to vancomycin, this isolate produced citrinin. From the algal endophyte *Aspergillus versicolor*, the compounds brevianamide M, 6,8-di-O-methylaverufin, and 6-O-methylaverufin were derived. This endophyte was found in the brown algae *Sargassum thunbergii*, and the three compounds in it were effective against *S. aureus* and *Escherichia coli*. The phylum Porifera is home to sessile filter feeders like marine sponges. They provide habitat for various organisms and play a crucial role in the cycle of nutrients. Sponges are home to archaea, bacteria, and eukaryotes, which account for between 40% and 60% of their volume. Due to their capacity to produce a variety of bioactive metabolites that act as a defense mechanism, sponges are of great interest to the pharmaceutical industry. Sadly, a huge amount of the example is expected to extricate a modest quantity of the metabolites. Additionally, sponge-associated fungi produce distinctive metabolites with antimicrobial potential. They can be cultured in the laboratory, unlike sponges, and the metabolite can be extracted in large quantities. Antiviral, antimicrobial, antifungal, antiprotozoal, anti-inflammatory, anticancer, and antioxidant compounds have been found to be produced by sponge-associated fungi, according to a number of studies.

Antimicrobial Property of Fungal Extract

Macroalgae are sea-going autotrophic multi-cell creatures that can be isolated into three gathering's strikingly red, green and earthy colored green growth. The pigment fucoxanthin gives brown algae, which belong to the Phaeophyceae family, their greenish-brown color. In some parts of the world, they are consumed as food and serve as marine organisms' homes. In macroalgae, fungi have been identified as parasites, saprophytes, or endophytes. Without exhibiting any symptoms, endophytic fungi spend a portion of their life cycle within the tissues or organs of their host. Red and brown algae have yielded a broader variety of endophytes than green algae. Endophyte species variety in macroalgae is impacted by natural elements, season, have species and age. Secondary metabolites produced by algae endophytes have significant pharmaceutical potential as well.

The first step in infection is the adhesion of pathogenic microbes to host tissue, which is essential for the pathogen's persistence in the host. Adhesins, microbial cell-surface molecules that encourage microbes to attach to the host tissue, are the mediators of this phenomenon. Interactions between adhesins and their particular receptors on the surface of the host-tissue determine the specificity of infecting (more effectively) a particular host or tissue (tissue tropism). Most fungal adhesins are glycoproteins or proteins, and both the carbohydrate and protein parts of these molecules have been shown to interact with the host tissue or molecules to make adhesion easier. Job of parasitic adhesins in tainting and colonizing host has been laid out by different analysts. The most notable of these studies demonstrates a decrease in adhesion and virulence of a fungal morphotype or morphotypes' adherence by creating deletion mutants or blocking their function. *Candida albicans* adhesins are the most extensively studied adhesins in mycology; However, new adhesins have recently been discovered for the majority of persistent fungal infections caused by other *Candida* spp., *Blastomyces dermatitidis*, *Coccidioides immitis*, *Cryptococcus neoformans*, *Paracoccidioides brasiliensis*, and *Aspergillus fumigatus* (Afu) are some of the bacteria.

Isolation of Marine Fungi

Fungi's cell wall components give them rigidity and shield them from the constraints of the environment. In *Candida* spp., carbohydrates like chitin and 1,3/1,6-glucan account for approximately 60%–70% of the total mass of the cell wall. Fungi with cell walls typically use a GPI anchor to covalently attach proteins to -glucan. Adhesins, aspartyl proteases, dismutases, and phospholipases are just a few of the cell-wall proteins that have been linked to the regulation of the primary interactions between the host and the pathogen. Our understanding of the function of fungal adhesins in mediating adhesion, aggregation, biofilm formation, and inhibiting the fungus-specific host immune response has been enhanced by biotechnological advancements and the application of sophisticated techniques. The majority of characterized adhesins are proteins with a rather intricate N-terminal domain that mediates particular peptide–peptide, peptide–sugar, and other peptide–ligand interactions. Among the GPI-anchored adhesins' conserved sequences are: a C-terminal peptide for GPI-ylation in the ER membrane and a N-terminal signal peptide for the endoplasmic reticulum (ER). A

variable domain with a low complexity and a lot of serine/threonine tandem repeats is located downstream of the N-terminal domain. These glycoproteins have a greater capacity for adhesion due to the presence of longer repeat regions, whereas shorter repeats result in decreased adhesion, possibly due to the fact that the effector N-terminal domain remains embedded in the cell wall in these cases. The majority of lignocellulosic biomass is made up of cellulose, hemicellulose, and lignin. The fundamental component of the recalcitrant plant secondary cell complex is polysaccharides and lignin. Enzymatic activity involving the conversion of cellulose into glucose and hemicelluloses into xylose by cellulase and xylanase, respectively, can effectively hydrolyze the lignocellulosic biomass. At the interaction zone, microscopic examinations of in-vitro fungal interactions revealed hyphal coiling, deformation, and a dense hyphal network. During the interaction process, biochemical changes like the overproduction of cellulase and xylanase were revealed in addition to the morphological changes. For business creation of cellulase and xylanase, this sort of cooperation can help in expanding the compound creation.