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Proceeding Paper

Evaluation of Antifungal Activities of Actinobacterial Extracts Isolated from Deep-Sea and *Laminaria ochroleuca* against Pathogenic Fungi †

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Marine actinobacteria produce secondary metabolites with many biological activities of interest, including antifungals. As fungal infections have increased in the last decade, it is important to search for new compounds. In this work, we aimed to evaluate the antifungal activities of marine actinobacteria extracts against pathogenic fungi. Thirty extracts of actinobacteria isolated from marine macroalgae and deep-sea samples were screened against fungi: yeasts (*Candida albicans* ATCC 90028, *Candida parapsilosis* ATCC 22019, *Cryptococcus neoformans* PYCC 3957T, *Cryptococcus laurentii* ZY8) and molds (*Aspergillus flavus* ATCC 204304, *Aspergillus fumigatus* ATCC 204305, *Aspergillus brasiliensis* ATCC 16404). We performed the disk diffusion method (DD), following the CLSI guidelines (M44-A, M38-A2 and M61). To determine the minimum inhibitory/fungicide concentration (MIC/MFC) we choose the extracts with inhibition zones ≥ 15mm, the cut-off for amphotericin B. Also, the effect of the best extracts on biofilm and germ tube formation were studied (*Candida* spp.).

In all organisms and for DD, the susceptibilities varied with species ($p < 0.0001$) and the extracts ($p < 0.0001$). *Cr. neoformans*, and *C. albicans* were the most susceptible species. The highest MICs were obtained for *Cryptococcus* spp., *C. parapsilosis and A. flavus* (all MIC >250 µg/mL). For *A. brasiliensis*, two extracts had the lowest MICs (15.62 µg/mL). The results for *C. albicans* were in the range of 15.62–125 µg/mL, and for *C. parapisilosis* MIC was >250 µg/mL. The MFC ranged from 15.62 to >250 µg/mL. In the biofilm assay, the percentage of inhibition varied greatly between extracts (0–96%). Also, some extracts significantly delayed the germ tube formation.

The extracts from deep-sea and *Laminaria ochroleuca* samples exhibited higher efficacy against fungi, mostly against yeasts and among these *C. albicans*, (33% of extracts), than *Chondrus crispus* and *Codium tomentosum*. The dereplication analysis of the extracts explained the antifungal activity of most of them.

Keywords: Candida; Aspergillus; disc diffusion method; minimum inhibitory concentration; minimum fungicide concentration; germ tube; biofilm

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