Evaluation of antifungal activities of actinobacterial extracts isolated from deep-sea and *Laminaria ochroleuca* against pathogenic fungi

Rita Maioto[1], *Inês Ribeiro[2], Mariana Girão[2], Maria F. Carvalho[2,3], and Ana Sampaio[1]*

[1]Centro de Investigação e Tecnologias Agroambientais e Biológicas (CITAB), Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal; [2]Interdisciplinary Center of Marine and Environmental Research, University of Porto, Porto, Portugal; [3]School of Medicine and Biomedical Sciences, University of Porto, Porto, Portugal

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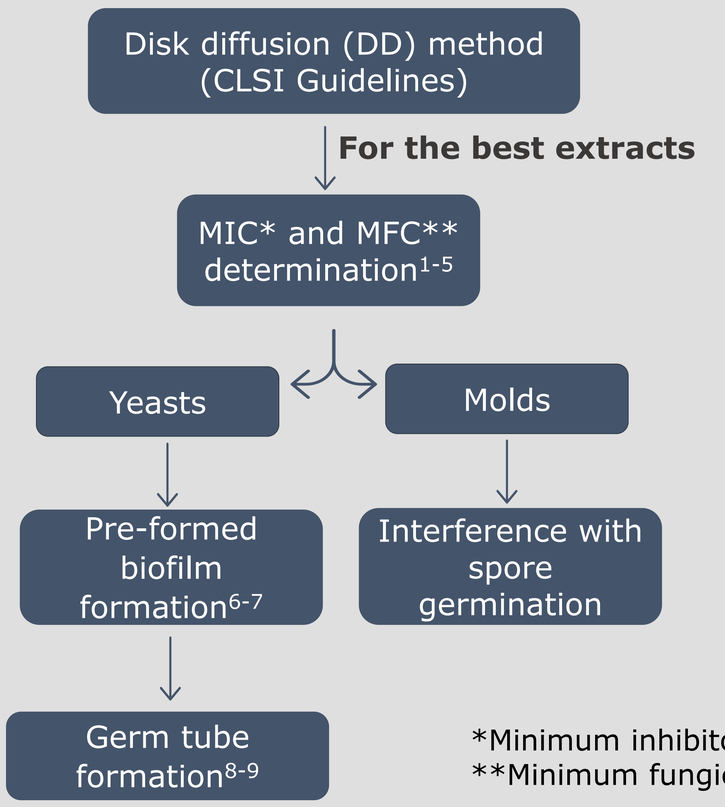
Introduction

The ability of marine actinobacteria to synthesize compounds with biological activities has been reported. However, it is still poorly known, especially its anti-fungal activity, unlike its terrestrial species. In addition, the decrease in sensitivity to commercial antifungals found in clinical isolates requires the search for new substances.

Objectives

In this work, our aim was to evaluate the antifungal activities of 30 marine actinobacteria extracts against pathogenic fungi. The actinobacteria were isolated from marine macroalgae and deep-sea samples. The screened fungi includes 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).

Methodology



*Minimum inhibitory concentration
**Minimum fungicide concentration

Results

The results of the DD method (diameter of the inhibition halo ≥ 15 mm) were used to choose the best ones for further testing.

Extracts	Source
M1, M2, M3, M4, M5, M6, M7, M8, M10, M14	*Laminaria ochroleuca*
J5.2, I4.2	Deep-sea sponge

The extracts with the best results obtained in DD technique, were tested to determine MIC and MFC. The results for MIC and MFC are represented in figure 1, for other species, all MIC and MFC tested values were higher than 250 µg/mL.

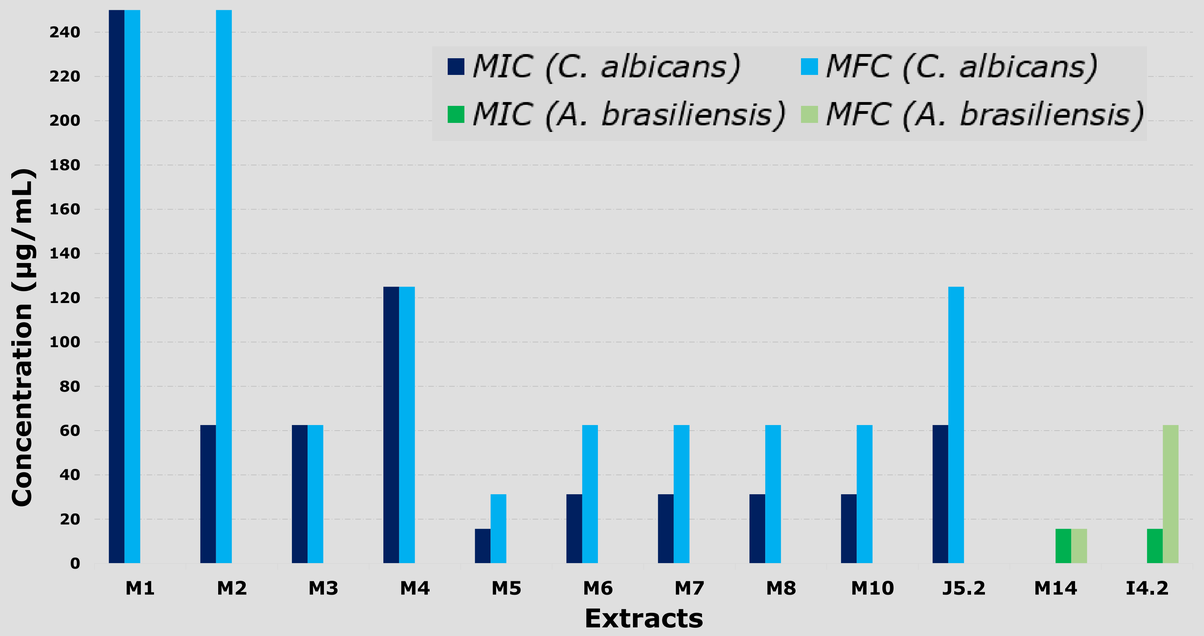


Fig. 1: MIC and MFC for the best extracts for *C. albicans* and *A. brasiliensis*.

The extracts tested against pre-formed biofilm (M1, M2, M5, M10, J5.2) showed biofilm reduction higher than 80% for *C. albicans.* For germ tube formation the extracts M3, M4 and J5.2 totally inhibited germ tube formation, and the extracts M2 reduced the size of germ tube (Fig.2).

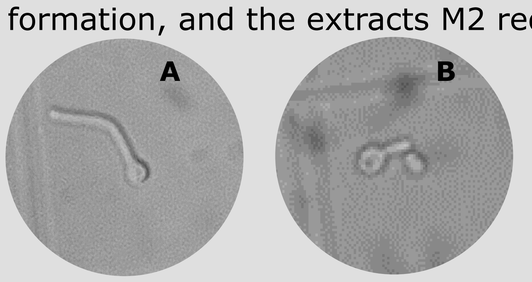


Fig. 2: Germ tube at 4 h of incubation at 37 ºC.
Control (without extracts) (A);
Effect of extract M2 in the germ tube formation (B).

For the mold *A. brasiliensis* the extracts tested do not showed any interference in the spore germination.

Conclusions

- 40% of the tested extracts have antifungal activities, specially *against C. albicans* and *A. brasiliensis*;
- Some extracts reduced *C. albicans* biofilms;
- Other extracts inhibited germ-tube formation;
- The extract J5.2 (from actinobacteria isolated from *L. ochroleuca)* showed very good results for MIC, MFC, pre-formed biofilm reduction, and germ tube formation.

Contact Information

Rita Maioto – rita.maioto@gmail.com
Maria F. Carvalho – mcarvalho@ciimar.up.pt
Ana Sampaio – asampaio@utad.pt

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