Evaluation of minimum inhibitory concentrations of plant extracts against environmental fungi and dermatophytes

Tiago B. Afonso[1], Adma N. F. Melo[1], Marta Carvalho[1], Tânia Ribeiro[1], Miguel Marques Pinto[2], Lillian Barros[3], Márcio Carocho[3], Freni Tavaria[1], Paula Teixeira[1], Manuela Pintado[1]

[1]Centre for Biotechnology and Fine Chemistry, Universidade Católica Portuguesa, Porto, Portugal

[2] Next Generation Chemistry, Unipessoal Lda, Porto, Portugal

[3] Centro de Investigação de Montanha (CIMO), Instituto Politécnico de Bragança, Campus de Santa Apolónia, Bragança, Portugal

CATÓLICA

CBQF · CENTRE FOR BIOTECHNOLOGY AND FINE CHEMISTRY ASSOCIATE LABORATORY CBQF

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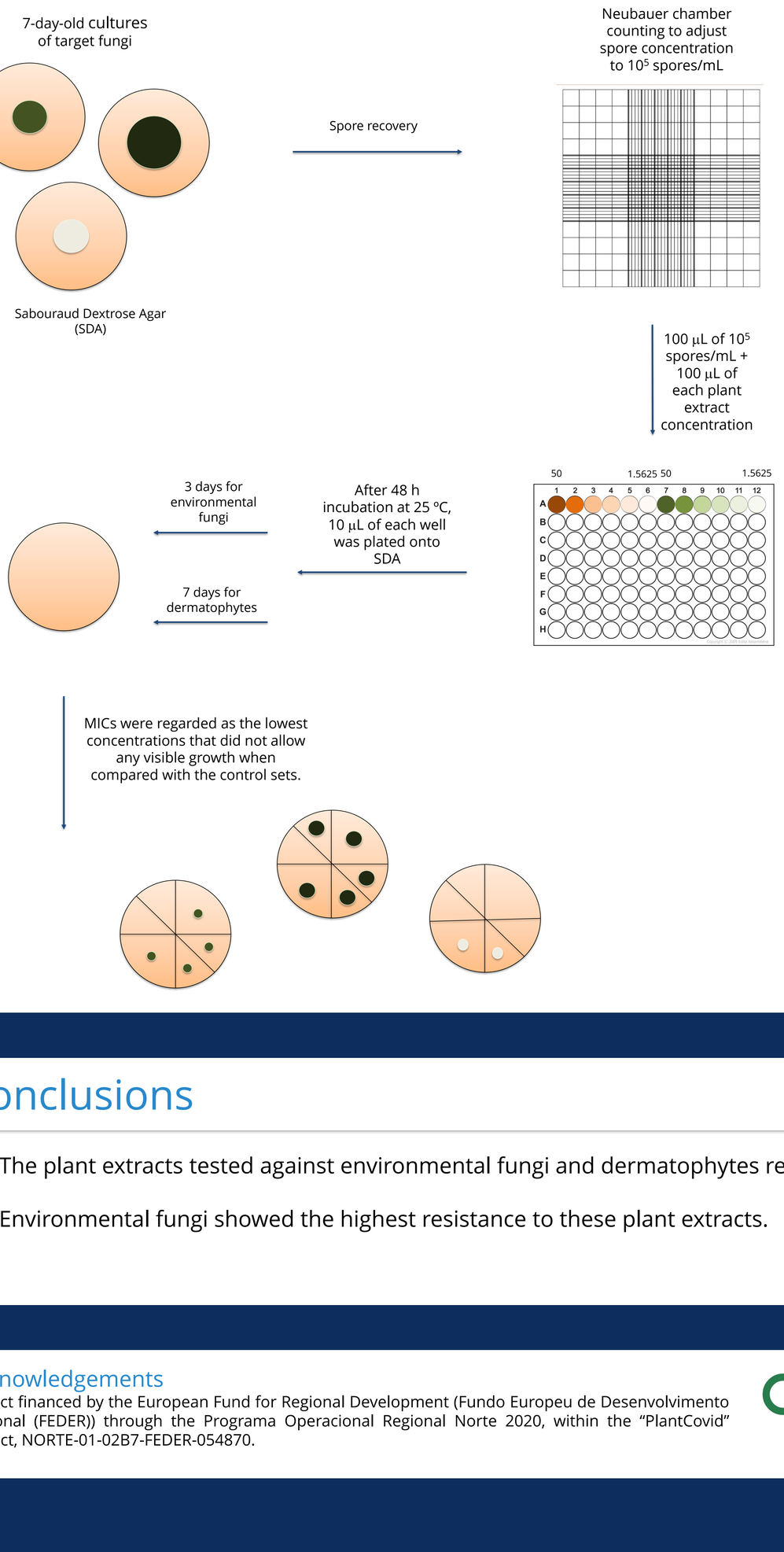
Introduction

The outbreak of COVID-19 disease caused by SARS-CoV-2 has led the scientific community to search for new alternatives to help control the virus. The use of face masks has been recommended as a preventive measure against the spread of SARS-CoV-2. Despite their health benefits, usage of single-use masks represents a threat to the environment as they are manufactured from long-lasting plastic materials. Reusable fabric masks are an alternative to reduce the risk of pollution and the amount of plastic wastage. The application of antimicrobial agents in the tissues used to produce masks would be an additional hurdle on the prevention of other respiratory infections and secondary fungal infections that occur from touching contaminated masks. In this context, impregnation of the fabrics with plant derived extracts is an attractive approach since they are potentially safe, free of adverse side effects, and powerful antimicrobials.

Objectives

The objective of this work was to study fifteen plant extracts to select the most efficient against environmental fungi and some dermatophytes. The minimum inhibitory concentration (MIC) of each extract was determined by broth microdilution in 96-well microtiter plates. Concentrations ranging from 50 mg/mL to 1.5625 mg/mL were tested against the different fungi.

Methods



Results

Table 1. MIC of plant extracts against environmental fungi and dermatophytes.

	A. niger	*A. flavus*	*A. fumigatus*	*A. ochraceus*	*Cladosporium sp.*	*E. amstelodami*	*F. verticillioides*	*P. expansum*	*Rhizopus sp.*	*T. mentagrophytes*	*M. canis*	*M. furfur*
Extract 1	-	-	-	-	-	-	-	-	-	50 mg/mL	-	-
Extract 2	-	-	-	-	-	-	-	-	-	50 mg/mL	-	-
Extract 3	-	-	-	-	-	-	-	-	-	3.125 mg/mL	25 mg/mL	-
Extract 4	-	-	-	-	-	-	-	-	-	12.5 mg/mL	50 mg/mL	-
Extract 5	-	-	-	-	-	-	-	-	-	25 mg/mL	25 mg/mL	30 mg/mL
Extract 6	-	-	-	-	50 mg/mL	-	50 mg/mL	-	-	6.25 mg/mL	50 mg/mL	40 mg/mL
Extract 7	-	-	-	-	-	-	-	-	-	25 mg/mL	12.5 mg/mL	-
Extract 8	-	-	-	-	-	-	-	-	-	25 mg/mL	50 mg/mL	-
Extract 9	-	-	-	-	-	-	-	-	-	6.25 mg/mL	12.5 mg/mL	-
Extract 10	-	-	-	-	-	-	-	-	-	12.5 mg/mL	25 mg/mL	-
Extract 11	-	-	-	-	-	-	-	-	-	12.5 mg/mL	25 mg/mL	-
Extract 12	-	-	-	-	-	-	-	-	-	12.5 mg/mL	12.5 mg/mL	-
Extract 13	-	-	-	-	-	-	-	-	-	25 mg/mL	12.5 mg/mL	-
Extract 14	-	-	-	-	-	-	-	-	-	50 mg/mL	25 mg/mL	-
Extract 15	-	-	-	-	-	-	-	-	-	6.25 mg/mL	-	50 mg/mL

- The results for the fifteen plant extracts tested against nine environmental fungal species revealed that only one extract was able to inhibit fungal growth of two of these fungi (*Cladosporium* sp. and *F. verticillioides*) at a concentration of 50 mg/mL.
- The results against the two filamentous fungi dermatophytes (*T. mentagrophytes* and *M. canis*) revealed these fungi to be the most susceptible to the extracts tested. Most of the extracts inhibited dermatophyte growth at concentrations below 50 mg/mL with the lowest MIC being registered at 3.125 mg/mL.
- Results for the yeast *M. furfur* revealed that only three plant derived extracts inhibited its growth with concentrations between 30 and 50 mg/mL.

Conclusions

✓ The plant extracts tested against environmental fungi and dermatophytes revealed to be more efficient against filamentous fungi dermatophyte growth.

✓ Environmental fungi showed the highest resistance to these plant extracts.

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