Bioprospection of antibiotics and biofilm inhibitors from under-exploited filamentous fungi

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In the past century, millions of lives were saved by antibiotics, which treat some of the historically more deadly diseases. However, bacteria may quickly develop antibiotic resistance and the speed of development of new drugs has decreased significantly in the last decades. Filamentous fungi have a great potential for novel antibiotic discovery, given their vast, largely unexplored metabolome. The One Strain MAny Compounds (OSMAC) approach serves as a tool to obtain a wide range of metabolites by varying various culture conditions. In this study, eight under-explored fungal species from Micoteca da Universidade do Minho (MUM) were used, aiming to identify compounds with antibiotic or antibiofilm properties produced by them: *Coprinopsis spilospora*, *Penicillium tunisiense*, *Trichoderma aestuarinum*, *Colletotrichum coccodes*, *Talaromyces saxoxalicus*, *Diaporthe phillipsii*, *Cladosporium rubrum*, and *Neopestalotiopsis scalabiensis*. They grew in different culture media, under submerged fermentation for 7 and 14 days under varying conditions of agitation and aeration, and the resulting supernatants were tested for their antimicrobial activity against *Staphylococcus aureus* and *Escherichia coli* using the disk diffusion method. Almost all fungi grew on the different media and under the diverse process conditions. It was found that *Coprinopsis spilospora* metabolites inhibited *S. aureus* growth and demonstrated antibiofilm properties. They reduced the biofilm by 74% in crystal violet staining, metabolic activity by 100% in Alamar blue test, and viable cell counts by 98% in CFU counting. The effect against E. coli was more modest, although still reduced CFU counts by 96%. High-pressure liquid chromatography/high-resolution mass spectrometry (HPLC/HRMS) showed that these results are likely due to the presence of compounds in the illudin family. The pioneer results obtained in the present study highlight the potential of filamentous fungi for bioprospection for antibiotic discovery.