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Mohammed Abneuf

Abstract

Decades ago, the Antarctic regions have been exploited for cold-tolerant microorganisms, prospecting various biological benefits, mainly psychrophilic enzymes and bioactive compounds. The first half of the present research aimed to study the occurrence of microfungi in samples of soil taken from Deception Island, Wilhelmina Bay and Yankee Bay, Maritime Antarctica. Attempt made to screen the biodiversity using conventional media and soil plating technique, yielded population of 27 species from the total of 14 soil samples. Of that, 13 fungal species were recorded from Deception Island, 8 from Wilhelmina Bay and 6 from Yankee Bay. Among the genera were *Aspergillus*, *Geomyces* and *Mucor*. Most of the fungal isolates proved to be cold-tolerant, as 15 isolates were psychrophilic, 9 mesophilic and 3 psychrotrophic. Nevertheless, there was no positive result regarding the occurrence of thermophilic fungi in the volcanic soil of Deception Island.

Second half of the research screened the isolates for the antimicrobial activity. Initially, plug assay (using 4 bacterial and 1 yeast pathogen namely *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Candida albicans* respectively) reported 18 fungal species with antibacterial potential, although no antifungal activity recorded. Subsequently disc diffusion assay was applied (after ethyl acetate extract obtained) using 5 bacterial species and 3 yeast pathogens, namely *Candida albicans*, *Saccharomyces cerevisiae*, *Schizosaccharomyces pombe*, *Staphylococcus aureus*, *Bacillus subtilis*, *Bacillus cereus*, *Escherichia coli* and *Pseudomonas aeruginosa*. Extract of 10 species (with good results on plug assay) were compared with chemically synthesize antibiotic (Chloramphenicol). However, Chloramphenicol generally recorded higher antibacterial activity with no antifungal

activity, while the extract of *Hyphomycetes* sp.8 does. Otherwise, no significant activities of fungal extracts reported on Gram positive more than Gram negative bacteria or vice versa. Finally, broth microdilution technique was applied to quantify the Minimum Inhibitory Concentration (MIC), Minimum Bactericidal Concentration (MBC) and Minimum Fungicidal Concentration (MFC) values for future drug development purposes.

In the end, Antarctic microfungi found to significantly inhibit wide range of bacterial pathogens and only one species can inhibit yeast pathogens and could be used in the development of new substances for pharmaceutical or agricultural purposes. To our knowledge, to date, there is no published data on the bioactivity of microfungi from Deception Island, Yankee Bay or Wilhelmina Bay.

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Symbols and Abbreviations

%	Percentage
˚C	Degree centigrade
B. cereus	*Bacillus cereus*
B. subtilis	*Bacillus subtilis*
$BaCl_2$	Barium chloride
C	Carbon
C. albicans	*Candida albicans*
CA	Antibiotic C3368-A
CFU	Colony Forming Unit
cm	Centimeter
CO_2	Carbon Dioxide
DMSO	Dimethyl Sulfoxoid
E. coli	*Escherichia coli*
EPS	Exopolysaccharide
EtOAc	Ethyl Acetate
g	Gram
GPS	Global Positioning System
H_2O	Water
H_2So_4	Sulphuric acid
IPY	International Polar Year
km	Kilometer
LBA	Luria Base Agar
M	mole
mbar	millibar
MBC	Minimum Bactericidal Concentration

MERGE	Microbiological and Ecological Response to Global Environmental changes in polar regions
MFC	Minimum Fungicidal Concentration
mg	Miligram
MIC	Minimum Inhibitory Concentration
ml	Mililitre
mm	Milimetre
NMR	Nuclear Magnetic Resonance spectroscopy
N	Nitrogen
NCCLS	National Committe of Clinical Laboratory Standards
No.	Number
P	Phosphate
P. aeruginosa	*Pseudomonas aeruginosa*
PDA	Potato Dextrose Agar
pH	Potential of Hydrogen
rpm	Round Per Minute
S	South
S. aureus	*Staphylococcus aureus*
S. cerevisiae	*Saccharomyces cerevisiae*
S. pombe	*Schizosaccharomyces pombe*
SDA	Saboraud Dextrose Agar
sp	Species
UV	Ultra Violet
W	Weast
w/v	Weight Per Volume
µg	Microgram
µl	Microlitre

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