Abstract

This research was made to study the antimicrobial activity of fungal isolates from different regions of maritime, Antarctica, namely, King George Island and Greenwich Island (Barrientos Island, Dee Island and Ambato point). A total of 17 isolates composed of 7 mesophilic and 10 psychrotrophic fungi were tested in-vitro against Gram-positive, Gram-negative bacteria and yeast human pathogens. Initial antimicrobial activity screening of Antarctic isolates was made using plug assay method. Five test-microorganisms namely *Candida albicans, Staphylococcus aureus, Bacillus subtilis, Escherichia coli* and *Pseudomonas aeruginosa* were used. Only five (out of 17) fungal isolates showed inhibition potency against the test-microorganisms and majority showed antibacterial activity rather than antifungal activity. Of these five species, three were psychrotrophic and two were mesophilic fungi. It should be pointed out that only two of the screened isolates inhibited the growth of *Candida albicans* despite the clearing zone diameter was smaller than 20mm. Based on these result, the five fungal isolates with good inhibition potency were selected for further studies. These species were then tested against large number of test-microorganisms by disc diffusion method. That showed only two fungal strains *Penicillium* sp. 20 and Deuteromycete sp. 25 have antibacterial activity against *P. aeruginosa* and *B. cereus.* Later, quantification assay using broth microdilution method was performed to determine the minimum inhibitory concentration (MIC) that showed from 12.5-25 mg/ml, minimum bactericidal concentration (MBC) showed between 25–1.56 mg/ml and minimum fungicidal concentration (MFC). The break point of minimum inhibitory concentration (MIC) was confirmed using indicator dye and both minimum bactericidal concentration (MBC) and

minimum fungicidal concentration (MFC) were confirmed by sub-culturing from the different dilutions of crude extract.

Abstrak

Penyelidikan ini dilakukan untuk mengkaji aktiviti antimikrob daripada isolasi kulat yang diperoleh dari kawasan maritim yang berbeza di Antartika iaitu Pulau King George dan Pulau Greenwich (Pulau Barrientos, Pulau Dee dan Ambato Point). Sebanyak 17 isolasi kulat yang terdiri daripada 7 kulat psikrotrofik dan 10 kulat mesofilik telah diuji secara *in-vitro* terhadap bakteria Gram-positif, bakteria Gram-negatif dan yis patogen manusia. Pemeriksaan awal aktiviti antimikrob terhadap isolasi kulat Antartika telah dilakukan dengan menggunakan kaedah cerakin palam (plug assay). Lima mikroorganisma ujian iaitu *Candida albicans, Staphylococcus aureus, Bacillus subtilis, Escherichia coli* dan *Pseudomonas aeruginosa* telah digunakan untuk penyelidikan ini. Hanya lima (daripada 17) isolasi kulat menunjukkan potensi perencatan terhadap mikroorganisma ujian dan majoriti daripada kulat-kulat tersebut menunjukkan aktiviti antibakteria berbanding aktiviti antikulat. Daripada kelima-lima spesies, tiga adalah kulat psikrotrofik dan dua lagi adalah kulat mesofilik. Perlu ditegaskan bahawa hanya dua daripada keseluruhan isolasi kulat yang disaring berjaya menghalang pertumbuhan *Candida albicans* walaupun diameter zon jernih adalah lebih kecil daripada 20 mm. Berdasarkan keputusan ini, lima isolasi kulat yang mempunyai potensi perencatan yang baik telah dipilih untuk kajian seterusnya. Spesies-spesies kulat ini telah diuji dengan sejumlah besar mikroorganisma ujian melalui kaedah resapan cakera (disc diffusion). Hanya dua strain kulat *Penicillium* sp. 20 dan Deuteromycete sp. 25 mempunyai aktiviti antibakteria terhadap *P. aeruginosa* dan *B. cereus*. Kemudian, assay kuantifikasi menggunakan kaedah *broth microdilution* dilakukan untuk menentukan kepekatan penghalang minimum (MIC) yang menunjukkan dari 12.5-25 mg/ml, kepekatan bakteria minimum (MBC) menujukkan antara 25-1.56 mg/ml

dan kepekatan kulat minimum (MFC). Takat rehat kepekatan kulat minimum (MIC) telah disahkan dengan menggunakan penunjuk pewarna manakala kepekatan bakteria minimum (MBC) dan kepekatan kulat minimum (MFC) telah disahkan dengan menggunakan sub-pengkulturan daripada pencairan ekstrak mentah yang berbeza.

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Wessam Mansour Filfilan

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%	**Percentage**
°C	**Degree centigrade**
$BaCl_2$	**Barium chloride**
C	**Carbon**
CFU	**Colony Forming Unit**
cm	**Centimeter**
CO_2	**Carbon Dioxide**
DMSO	**Dimethyl Sulfoxide**
EPS	**Exopolysaccharide**
EtOAc	**Ethyl Acetate**
g	**Gram**
GPS	**Global Positioning System**
H_2O	**Water**
H_2SO_4	**Sulphuric acid**
IPY	**International Polar Year**
Km	**Kilometre**

LBA	**Luria Base Agar**
M	**Mole**
Mbar	**Millibar**
MBC	**Minimum Bactericidal Concentration**
MFC	**Minimum Fungicidal Concentration**
MIC	**Minimum Inhibitory Concentration**
mg	**Milligram**
MERGE	**Microbiological and Ecological Response to Global Environmental changes in Polar Regions**
ml	**Millilitre**
mm	**Millimetre**
N	**Nitrogen**
NMR	**Nuclear Magnetic Resonance spectroscopy**
NCCLs	**National Committee of Clinical Laboratory Standards**
No.	**Number**
PDA	**Potato Dextrose Agar**
pH	**Potential of Hydrogen**

psi	**Pounds per Square inch of pressure**
rpm	**Round Per Minute**
S	**South**
SDA	**Saboraud Dextrose Agar**
Sp.	**Species**
UV	**Ultra Violet**
W	**West**
w/v	**Weight Per Volume**
ml	**Microliter**
µg	**Microgram**

List of Appendices

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Chapter 3