

Abstrak

Pemisahan dan pencirian metabolit sekunder serta penyaringan aktiviti biologi telah dilakukan ke atas lima spesies karang lembut iaitu *Sinularia brassica*, *S. frondosa*, *Sarcophyton glaucum*, *S. trocheliopherum* dan *Cladiella* sp.. Tiga sebatian terbitan indola iaitu N-metil-3,4,5-tribromoindola, N-metil-3,5,6-tribromoindola dan 3,5,6-tribromoindola telah ditulenkan dan dicirikan dari *Sinularia frondosa*. Sebatian N-metil-3,4,5-tribromoindola dan N-metil-3,5,6-tribromoindola telah dipisahkan secara kaedah kromatografi turus berulang menggunakan sistem pelarut $C_6H_{14} : CH_2Cl_2$ (heksana : diklorometana) (1 : 1) dan kaedah kromatografi lapisan nipis persediaan dengan sistem pelarut $C_6H_{14} : Et_2O$ (heksana : dietil eter) (4 : 1). Sebatian 3,5,6-tribromoindola pula telah dipisahkan secara kaedah kromatografi turus dengan sistem pelarut CH_2Cl_2 . Sebatian N-metil-3,4,5-tribromoindola dan N-metil-3,5,6-tribromoindola yang diperolehi merupakan hablur putih berbentuk jejaram dengan takat lebur 116 – 118 °C dan 160 – 162 °C masing-masingnya. Sebatian 3,5,6-tribromoindola merupakan hablur perang berbentuk jejaram dengan takat lebur 106 – 108 °C. Struktur ketiga-tiga sebatian tersebut telah ditentukan berdasarkan maklumat spektroskopi inframerah, resonans magnet nukleus (RMN 1H dan RMN ^{13}C) dan spektrometri jisim. Ujian ketoksikan, penyaringan antikulat dan penyaringan antibakteria telah dilakukan ke atas ekstrak ke lima-lima spesies karang lembut yang dikaji. Keputusan menunjukkan kesemua partisi dari karang lembut yang dikaji adalah toksik ke atas larva udang *Artemia salina* dengan nilai LC_{50} dalam julat 1-70 $\mu g/mL$. Partisi diklorometana karang lembut *Cladiella* sp. dan *Sarcophyton trocheliopherum*, partisi heksana *Sarcophyton glaucum* dan *Sarcophyton trocheliopherum* serta partisi etil asetat *Sarcophyton glaucum* dan *Sarcophyton*

trocheliopherum memberikan ketoksikan yang tinggi dengan nilai LC₅₀ di antara 1-3 µg/mL. Penyaringan antikulat pula mendapati partisi dari ke lima-lima spesies karang lembut yang dikaji menunjukkan perencatan ke atas kulat *Aspergillus niger* dalam julat 15.29 - 23.56 % dan ke atas *Fusarium* sp. dalam julat 15.91 - 24.92 % pada kepekatan 80 ppm. Partisi etil asetat dari *Sinularia frondosa* memberikan kesan perencatan tertinggi (23.56 %) ke atas *Aspergillus niger* manakala partisi diklorometana *Sinularia brassica* memberikan perencatan tertinggi (24.92 %) ke atas *Fusarium* sp.. Keputusan penyaringan antibakteria menunjukkan semua partisi dari karang lembut yang dikaji memberikan aktiviti antibakteria sekurang-kurangnya ke atas lima spesies bakteria dari 15 bakteria yang diuji pada kepekatan 2.5 mg/cakera. Partisi diklorometana dari kesemua karang lembut yang dikaji khususnya *Sinularia brassica* didapati merencat kesemua bakteria yang telah diuji. Aktiviti antibakteria yang diberikan oleh partisi diklorometana adalah setanding dengan antibiotik tetrasiklin yang telah digunakan sebagai kawalan. Kesan kepekatan partisi diklorometana ke atas aktiviti antibakteria terhadap *Escherichia coli*, *Bacillus subtilis*, *Pseudomonas aeruginosa* dan *Staphylococcus aureus* telah juga diselidiki. Aktiviti antibakteria telah dicerap ke atas kesemua bakteria yang telah digunakan walaupun pada kepekatan yang rendah kecuali partisi diklorometana dari karang lembut *Sinularia frondosa* yang tidak memberikan aktiviti antibakteria ke atas *Bacillus subtilis* pada semua kepekatan yang telah diuji. Sebatian N-metil-3,4,5-tribromoindola dan N-metil-3,5,6-tribromoindola didapati memberikan aktiviti antibakteria yang kuat terhadap bakteria Gram negatif iaitu *Escherichia coli* dan *Pseudomonas aeruginosa* serta bakteria Gram positif iaitu *Bacillus subtilis* dan *Staphylococcus aureus* pada kepekatan 2.5 mg/cakera. Sebaliknya, sebatian 3,5,6-

tribromoindola tidak memberikan sebarang aktiviti antibakteria pada kepekatan yang sama.

Kata kunci Karang lembut, N-metil-3,4,5-tribromoindola, N-metil-3,5,6-tribromoindola, 3,5,6-tribromoindola, ketoksikan, antikulat, antibakteria.

Chemical Studies and Biological Activities Screening on Five Species of Soft Corals

(Alcyonaceae)

Abstract

Isolation and characterization of secondary metabolites and biological activity screening on five species of soft corals Sinularia brassica, S. frondosa, Sarcophyton glaucum, S. trocheliopherum and Cladiella sp. have been performed. Three compounds of indole derivative have been purified and characterized from Sinularia frondosa. The compounds have been identified as *N*-methyl-3,4,5-tribromoindole, *N*-methyl-3,5,6-tribromoindole and 3,5,6-tribromoindole. *N*-methyl-3,4,5-tribromoindole and *N*-methyl-3,5,6-tribromoindole have been isolated by extensive column chromatography techniques using $C_6H_{14} : CH_2Cl_2$ (hexane : dichloromethane) (1 : 1) and preparative thin layer chromatography using $C_6H_{14} : Et_2O$ (hexane : diethyl ether) (4 : 1). 3,5,6-Tribromoindole was purified by column chromatography using CH_2Cl_2 . *N*-methyl-3,4,5-Tribromoindole and *N*-methyl-3,5,6-tribromoindole were obtained as a white crystalline needles with melting point of 116 – 118 °C and 160 – 162 °C, respectively. 3,5,6-tribromoindole was obtained as a pale brown crystalline needles with melting point of 106 – 108 °C. The structures of all compounds were established based on various spectroscopic techniques such as infrared, nuclear magnetic resonans (1H - NMR, ^{13}C -NMR) and mass spectrometry. Toxicity, antifungal and antibacterial screening have been performed on all the five species of soft corals studied. Results showed that all the partition of the soft corals were toxic to the brine shrimps Artemia salina with LC_{50} value between 1 – 70 $\mu g/mL$. Dichloromethane partition of Cladiella sp. and Sarcophyton trocheliopherum, hexane partition of Sarcophyton glaucum and Sarcophyton trocheliopherum and ethyl acetate partition of Sarcophyton glaucum and Sarcophyton trocheliopherum gave strong toxicity against brine shrimp Artemia

salina with LC_{50} in a range of 1 – 3 $\mu\text{g/mL}$. Antifungal screening showed that all the partition obtained from the five species of soft coral studied inhibit Aspergillus niger and Fusarium sp. with inhibition zone of 15.29 - 23.56 % and 15.91 – 24.92 %, respectively at concentration of 80 ppm. Ethyl acetate partition from Sinularia frondosa showed strongest inhibition (23.56 %) towards Aspergillus niger while dichloromethane partition from Sinularia brassica showed strongest inhibition (24.92 %) towards Fusarium sp.. Antibacterial screening showed that all the partition from the five species of soft corals studied exhibited antibacterial activity at least towards five species of bacteria out of 15 species of bacteria tested at a concentration of 2.5 mg/disk. Dichloromethane partition from all the soft corals studied especially Sinularia brassica showed strong antibacterial activity towards all the bacteria tested. The dichloromethane partitions showed antibacterial activity similar to tetracycline antibiotic used as a control. The effect of concentration on the antibacterial activity of dichloromethane partition against Escherichia coli, Bacillus subtilis, Pseudomonas aeruginosa and Staphylococcus aureus were also tested.) All the dichloromethane partition showed antibacterial activity even at low concentration except for dichloromethane partition of Sinularia frondosa which did not showed any antibacterial activity against Bacillus subtilis at all concentration tested. Antibacterial screening on the pure compounds showed that N-methyl-3,4,5-tribromoindole and N-methyl-3,5,6-tribromoindole exhibits strong antibacterial activity towards Gram negative bacteria Escherichia coli and Pseudomonas aeruginosa and Gram positive bacteria Bacillus subtilis and Staphylococcus aureus at a concentration of 2.5 mg/disk. 3,5,6-Tribromoindole does not shows any antibacterial activity at similar concentration .

Keywords Soft coral, N-methyl-3,4,5-tribromoindole, N-methyl-3,5,6-tribromoindole, 3,5,6-Tribromoindole, toxicity, antifungal, antibacterial.

