

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfilment of the requirements for the degree of Master of Science

**PHYTOCHEMICAL PROFILES, ANTIBACTERIAL, AND CYTOTOXICITY
ACTIVITIES OF SELECTED COASTAL PLANTS AGAINST SEVERAL
BACTERIA CAUSING PNEUMONIA**

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Pneumonia is a respiratory infection caused by microorganisms, including bacteria. Current antibiotic treatment often leads to bacterial resistance, necessitating alternative therapies such as utilizing coastal plants. In this study, five parts of eleven coastal plants underwent phytochemical screening and were investigated for their antibacterial activity against five bacteria causing pneumonia. Cold extraction was performed using hexane and methanol, successively. Qualitative phytochemicals screening and antibacterial testing were done using several reagents and agar well diffusion method, respectively. Cytotoxicity activity was assessed using the MTT assay on MRC-5 cell lines. HPTLC profiling was utilized to determine the group compound profiles present in the extracts. The coastal plants revealed the presence of various phytochemicals such as flavonoids, alkaloids, terpenoids, phenols, tannins, quinones, saponins, and glycosides. The antibacterial results revealed that almost all hexane and methanolic extracts from coastal plants showed antibacterial activity, except *Vitex rotundifolia* leaves. The highest activity was shown by hexane extract of *Rhodomyrtus tomentosa* leaves against *Staphylococcus aureus* (21.67 ± 1.25) and *Staphylococcus cohnii* (22.67 ± 0.94) with MIC 0.625 mg/mL. Among the methanolic extracts, *Syzygium grande* twigs exhibited the highest antibacterial property ($19.33 \pm$

0.94). Cytotoxicity testing revealed that 27 extracts were non-cytotoxic, 3 were moderately cytotoxic, and 7 were highly cytotoxic, with most of the methanolic extracts showing no cytotoxicity against MRC-5 cell lines, except for IPTM, which exhibited moderate cytotoxicity. The methanolic extracts of SGLM, SGTM, MMLM, MMTM, MMFM, RTLm, TCLM, CRRM, SALM, SATM, PPSM, and PPRM were active against *K. pneumoniae* and/or *S. aureus* without inducing cytotoxicity against MRC-5 cells. These extracts revealed the most phytochemical group compounds of flavonoid and phenolics, potentially correlating with their antibacterial activity. In summary, some selected coastal plants have the potential to act as antibacterial agent against pneumonia.

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**PROFIL FITOKIMIA, AKTIVITI ANTIBAKTERIA, DAN SITOTOKSISITI
TUMBUHAN PANTAI TERPILIH MENENTANG BEBERAPA BAKTERIA
PENYEBAB PENUMONIA**

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Pneumonia adalah jangkitan pernafasan yang disebabkan oleh mikroorganisma, termasuk bakteria. Rawatan antibiotik semasa menyebabkan rintangan bakteria, oleh itu memerlukan terapi alternatif seperti menggunakan tumbuhan pantai. Dalam kajian ini, lima bahagian pokok dari sebelas tumbuhan pantai dijalankan penyaringan fitokimia dan dikaji untuk aktiviti antibakteria terhadap lima bakteria yang menyebabkan pneumonia. Pengekstrakan sejuk dilakukan menggunakan heksana dan metanol secara berturutan. Penyaringan fitokimia kualitatif dan ujian antibakteria dilakukan menggunakan masing-masing beberapa bahan kimia dan kaedah penyebaran agar. Aktiviti sitotoksik dinilai menggunakan ujian MTT pada sel MRC-5. HPTLC digunakan untuk menentukan profil sebatian kumpulan yang terkandung dalam ekstrak. Tumbuhan pantai menunjukkan kehadiran pelbagai fitokimia seperti flavonoid, alkaloid, terpenoid, fenol, tanin, kinon, saponin, dan glukosida. Hasil ujian antibakteria menunjukkan bahawa hampir semua ekstrak heksana dan metanol dari tumbuhan pantai menunjukkan aktiviti antibakteria, kecuali daun *Vitex rotundifolia*. Aktiviti tertinggi ditunjukkan oleh ekstrak heksana daun *Rhodomyrtus tomentosa* terhadap *Staphylococcus aureus* (21.67 ± 1.25) dan *Staphylococcus cohnii* (22.67 ± 0.94) dengan MIC 0.625 mg/mL. Di antara ekstrak

metanol, dahan *Syzygium grande* menunjukkan sifat antibakteria tertinggi (19.33 ± 0.94). Ujian sitotoksik menunjukkan bahawa 27 ekstrak tidak sitotoksik, 3 sedikit sitotoksik, dan 7 sangat sitotoksik, dengan kebanyakan ekstrak metanol menunjukkan tiada sitotoksiti terhadap sel MRC-5, kecuali IPTM, yang menunjukkan sedikit sitotoksiti. Ekstrak metanol SGLM, SGTM, MMLM, MMTM, MMFM, RTLM, TCLM, CRRM, SALM, SATM, PPSM, dan PPRM aktif terhadap *K. pneumoniae* dan/atau *S. aureus* tanpa menimbulkan sitotoksiti terhadap sel MRC-5. Ekstrak ini menunjukkan kumpulan sebatian fitokimia yang paling banyak flavonoid dan fenol, yang berpotensi berkorelasi dengan aktiviti antibakteria. Secara kesimpulannya, beberapa tumbuhan pantai yang dipilih mempunyai potensi untuk bertindak sebagai agen antibakteria penyebab pneumonia.