

ABSTRAK

ISOLASI DAN KARAKTERISASI SENYAWA BIOAKTIF ANTIKANKER DARI SPONS TAMAN NASIONAL BUNAKEN, MANADO, TERHADAP SEL KANKER PARU-PARU (A549), SERVIKS (HeLa), DAN PAYUDARA (MCF-7)

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Spons laut merupakan sumber senyawa bioaktif yang berpotensi sebagai antikanker. Penelitian ini bertujuan mengisolasi dan mengarakterisasi senyawa bioaktif antikanker dari spons asal perairan Taman Nasional Bunaken, Manado. Ekstraksi dilakukan melalui maserasi menggunakan metanol, diikuti partisi cair-cair dengan etil asetat dan air. Isolasi senyawa aktif menggunakan pendekatan *bioassay-guided isolation* melalui kromatografi kolom terbuka (KKT) dan *solid phase extraction* (SPE) Sep-Pak C₁₈. Aktivitas sitotoksik diuji terhadap sel A549, HeLa, dan MCF-7 dengan metode MTT Assay, sedangkan karakterisasi struktur dilakukan menggunakan LC-MS dan ¹H-NMR.

Hasil penelitian menunjukkan fraksi etil asetat memiliki aktivitas inhibisi lebih kuat dibandingkan fraksi air. Spons *Hippospongia* sp. menghasilkan empat senyawa yang berhasil diidentifikasi, yaitu *demethylfurospingin-4* (**11**) dengan aktivitas sitotoksik pada sel A549 (IC₅₀ 0,1292 µg/mL), HeLa (IC₅₀ 0,00007 µg/mL), dan MCF-7 (IC₅₀ 0,1 µg/mL); *furospingin-2* (**12**) dengan aktivitas sitotoksik pada sel A549 (IC₅₀ 3,0 µg/mL), HeLa (IC₅₀ 54,7 µg/mL), dan MCF-7 (IC₅₀ 8,4 µg/mL); *dibutyl phthalate* (**14**) dengan aktivitas sitotoksik pada sel A549 (IC₅₀ 11,6 µg/mL), HeLa (IC₅₀ 3,7 µg/mL), dan MCF-7 (IC₅₀ 16,2 µg/mL); serta *hippospondine F* (**15**) dengan aktivitas sitotoksik pada sel A549 (IC₅₀ 3,1 µg/mL), HeLa (IC₅₀ 8,7 µg/mL), dan MCF-7 (IC₅₀ 14,1 µg/mL). Spons *Spongia* sp. menghasilkan satu senyawa yaitu *cyclopeptin* (**17**) dengan aktivitas sitotoksik pada sel A549 (IC₅₀ 24,85 µg/mL), HeLa (IC₅₀ 10,58 µg/mL) dan MCF-7 (IC₅₀ 27,0 µg/mL). Hasil penelitian ini membuktikan bahwa spons laut Taman Nasional Bunaken berpotensi sebagai sumber metabolit sekunder bioaktif yang dapat dikembangkan lebih lanjut sebagai kandidat antikanker alami.

Kata kunci: A549, HeLa, MCF-7, MTT assay, senyawa antikanker, spons laut

ABSTRACT

ISOLATION AND CHARACTERIZATION OF BIOACTIVE ANTICANCER COMPOUNDS FROM MARINE SPONGES OF BUNAKEN NATIONAL PARK, MANADO, AGAINST LUNG (A549), CERVICAL (HeLa), AND BREAST (MCF-7) CANCER CELLS

By

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Marine sponges are a source of bioactive compounds with potential anticancer activity. This study aimed to isolate and characterize anticancer bioactive compounds from sponges collected from the waters of Bunaken National Park, Manado. Extraction was carried out by maceration using methanol, followed by liquid-liquid partition using ethyl acetate and water. Isolation of active compounds was performed using a bioassay-guided isolation approach through open column chromatography (OCC) and Sep-Pak C₁₈ solid phase extraction (SPE). Cytotoxic activity was evaluated against A549, HeLa, and MCF-7 cells using the MTT assay, while structural characterization was conducted using LC-MS and ¹H-NMR analyses. The ethyl acetate fraction exhibited stronger inhibitory activity than the aqueous fraction. Sponge *Hippospongia* sp. produced four identified compounds, namely Demethylfurospongin-4 (**11**) with cytotoxic activity against A549 (IC₅₀ 0.1292 µg/mL), HeLa (IC₅₀ 0.00007 µg/mL), and MCF-7 (IC₅₀ 0.1 µg/mL) cells; furospongin-2 (**12**) with cytotoxic activity against A549 (IC₅₀ 3.0 µg/mL), HeLa (IC₅₀ 54.7 µg/mL), and MCF-7 (IC₅₀ 8.4 µg/mL) cells; dibutyl phthalate (**14**) with cytotoxic activity against A549 (IC₅₀ 11.6 µg/mL), HeLa (IC₅₀ 3.7 µg/mL), and MCF-7 (IC₅₀ 16.2 µg/mL) cells; and hippospondine F (**15**) with cytotoxic activity against A549 (IC₅₀ 3.1 µg/mL), HeLa (IC₅₀ 8.7 µg/mL), and MCF-7 (IC₅₀ 14.1 µg/mL) cells. Sponge *Spongia* sp. produced one compound, cyclopeptin (**17**), which exhibited cytotoxic activity against A549 (IC₅₀ 24.85 µg/mL), HeLa (IC₅₀ 10.58 µg/mL), and MCF-7 (IC₅₀ 27.0 µg/mL) cells. These findings demonstrate that marine sponges from Bunaken National Park have strong potential as sources of bioactive secondary metabolites that may be further developed as natural anticancer candidates.

Keywords: A549, HeLa, MCF-7, MTT assay, anticancer compounds, marine sponges