

ABSTRAK

Turbinaria sp. merupakan makroalga coklat yang memiliki potensi senyawa bioaktif sebagai antioksidan, anti-inflamasi, antikoagulan, antivirus dan antitumor. Penelitian mengenai *DNA barcoding* dan variasi temporal profil metabolomik *Turbinaria* sp. perlu dilakukan untuk mengungkapkan komposisi biokimia dan aplikasi potensial dalam industri nutraseutikal ataupun pangan fungsional. Penelitian mengenai variasi temporal diperlukan dalam standarisasi bahan baku dari alam, besaran deviasi dalam keseragaman mutu dan khasiatnya. Tujuan penelitian ini adalah mengidentifikasi secara morfologi, anatomi, dan molekuler, serta menganalisa variasi temporal profil metabolomik *Turbinaria* sp. dari Pantai Karapyak, Pangandaran. Sampel *Turbinaria* sp. diidentifikasi molekuler menggunakan *DNA-barcoding* untuk hasil yang akurat. Profil metabolomik *Turbinaria* sp. dianalisis menggunakan LC-HRMS (*Liquid Chromatography High Resolution Mass Spectrometry*). Hasil analisis *BLAST* *Turbinaria* sp. dari Pantai Karapyak teridentifikasi memiliki nilai similaritas cukup tinggi dengan *Turbinaria ornata* isolat SYL19032609 asal China yaitu sebesar 97,53%-98,99%. Hasil analisis metabolomik terdapat sepuluh senyawa yang terderekupasi, diantaranya 13-docosenamide (m/z 675,678), pyropheophorbide-a (m/z 535,271), pheophytin (m/z 871,58), pheophorbide-a (m/z 593,286), propyl-palmitate (m/z 483,628), MGDG (m/z 795,505), trimethylazanium (m/z 738,63), propoxy-phosphinic acid (m/z 745,149), 1,5-dihexadecoxy (m/z 710,591), dan 2-carboxymethoxy (m/z 686,549). Berdasarkan studi literatur beberapa senyawa memiliki aktivitas antibakteri, antijamur, antikanker, antioksidan, dan antiinflamasi. Manfaat lainnya sebagai bahan fotosensitizer alami, bioaditif minyak diesel, dan pengemulsi pada industri bahan makanan.

Kata kunci: *DNA-barcoding, metabolomik, LC-HRMS, temporal, Turbinaria.*

ABSTRACT

Turbinaria sp. is a brown macroalga with promising bioactive compounds exhibiting antioxidant, anti-inflammatory, anticoagulant, antiviral, and antitumor properties. Research on DNA barcoding and temporal variation of its metabolomic profile is essential to reveal biochemical composition and potential applications in nutraceutical and functional food industries. Temporal variation studies are also needed to support raw material standardization from natural resources and to evaluate consistency in quality and efficacy. This study aimed to identify *Turbinaria* sp. morphologically, anatomically, and molecularly, as well as to analyze the temporal variation of its metabolomic profile from Karapyak Beach, Pangandaran. Molecular identification was performed using DNA barcoding, while metabolomic profiling was analyzed by LC-HRMS (Liquid Chromatography–High Resolution Mass Spectrometry). BLAST results indicated that *Turbinaria* sp. from Karapyak showed high similarity (97.53%–98.99%) with *Turbinaria ornata* isolate SYL19032609 from China. Metabolomic analysis revealed ten dereplicated compounds, including 13-docosenamide (m/z 675.678), pyropheophorbide-a (m/z 535.271), pheophytin (m/z 871.58), pheophorbide-a (m/z 593.286), propyl-palmitate (m/z 483.628), MGDG (m/z 795.505), trimethylazanium (m/z 738.63), propoxy-phosphinic acid (m/z 745.149), 1,5-dihexadecoxy (m/z 710.591), and 2-carboxymethoxy (m/z 686.549). Literature review indicates that these compounds exhibit antibacterial, antifungal, anticancer, antioxidant, and anti-inflammatory activities, with additional potential as natural photosensitizers, diesel bioadditives, and food emulsifiers.

Keywords: DNA-barcoding, metabolomics, LC-HRMS, temporal, *Turbinaria*