

RINGKASAN

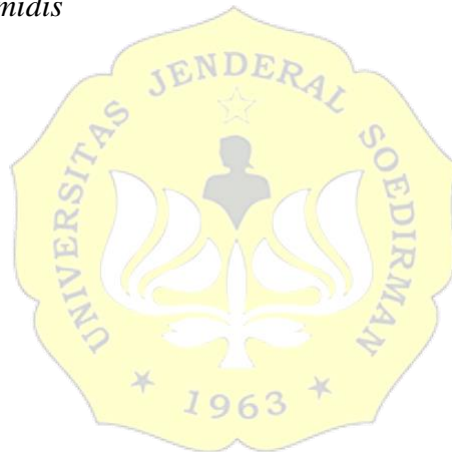
Rumput laut mengandung bakteri endofit dengan keanekaragaman yang tinggi. Bakteri endofit mampu memproduksi senyawa bioaktif dengan aktivitas menghambat pertumbuhan bakteri patogen, yaitu bakteri yang menyebabkan penyakit bagi organisme lain. Bakteri patogen di antaranya adalah *Staphylococcus aureus* dan *Staphylococcus epidermidis* penyebab penyakit kulit (*dandruff*). Tujuan dari penelitian ini yaitu mengetahui keberadaan bakteri endofit pada rumput laut *Turbinaria ornata*, *Sargassum crassifolium*, dan *Sargassum polycystum*, kemampuan bakteri endofit dalam menghambat pertumbuhan *S. aureus* dan *S. epidermidis*, mengidentifikasi golongan senyawa yang bersifat antibakteri dan mengidentifikasi isolat potensial yang bersifat antibakteri *S. aureus* dan *S. epidermidis*.

Rumput laut dikoleksi dari perairan laut Pulau Panjang, Kabupaten Jepara, Jawa Tengah, pada bulan Februari 2023. Isolat bakteri endofit yang berhasil diisolasi dan dipurifikasi selanjutnya diuji tantang terhadap bakteri *S. aureus* dan *S. epidermidis*. Tiga isolat dengan aktivitas antibakteri tertinggi dipilih untuk menghasilkan senyawa antibakteri. Ekstraksi senyawa antibakteri menggunakan pelarut etil asetat untuk memperoleh ekstrak kasar senyawa antibakteri. Sampel ekstrak kasar digunakan dalam uji antibakteri dengan metode difusi (metode kertas cakram), *Minimum Inhibitory Concentration* (MIC), dan *Minimum Bactericidal Concentration* (MBC). Identifikasi golongan senyawa kimia pada ekstrak dilakukan dengan metode *Thin Layer Chromatography* (TLC) dan *Gas Chromatography and Mass Spectroscopy* (GCMS). Identifikasi isolat bakteri endofit potensial dilakukan dengan metode molekuler berbasis gen 16S rRNA.

Sebanyak 25 isolat bakteri endofit diisolasi dari 3 spesies rumput laut, yaitu 11 isolat dari *T. ornata*, 7 isolat dari *S. crassifolium*, dan 7 isolat dari *S. polycystum*. Tiga isolat dengan aktivitas antibakteri tertinggi pada uji tantang yaitu isolat To.09.pp, To.10.pp, dan Sc.06.pp. Uji antibakteri dengan metode kertas cakram menunjukkan hasil diameter zona hambat (*zone of inhibition/ZOI*) 12-35 mm dengan intensitas kuat hingga sangat kuat. Nilai MIC ekstrak kasar isolat To.10.pp menunjukkan konsentrasi 937,5 µg/mL menghambat *S. aureus* dan

konsentrasi 1875 µg/mL menghambat *S. epidermidis*. Nilai MBC ekstrak isolat To.10.pp dengan konsentrasi 1875 µg/mL efektif membunuh *S. aureus* dan *S. epidermidis*. Identifikasi golongan senyawa kimia dengan metode TLC dan fitokimia pada ekstrak kasar menunjukkan bahwa isolat To.10.pp memproduksi flavonoid, alkaloid, dan terpenoid. Identifikasi GCMS menunjukkan 76 *peak* pada kromatogram dan 11 golongan senyawa. Identifikasi molekuler terhadap isolat bakteri endofit potensial yaitu isolat To.09.pp memiliki kemiripan 100% dengan *Acinetobacter indicus* strain 80-1-2 (100%), isolat To.10.pp memiliki kemiripan 99,65% terhadap *Vibrio harveyi* strain B14-1, dan isolat Sc.06.pp memiliki kemiripan 99% terhadap *Acinetobacter indicus* strain 80-1-2.

Kata kunci: Antibakteri, Bakteri endofit, Rumput laut, *Staphylococcus aureus*, *Staphylococcus epidermidis*



SUMMARY

Endophytic bacteria in seaweed are noted to have high diversity. Endophytic bacteria are able to produce bioactive compounds that inhibit the growth of pathogenic bacteria. Pathogenic bacteria are bacteria that cause disease for other organisms, including *Staphylococcus aureus* and *Staphylococcus epidermidis* that cause skin disease (dandruff). The purpose of this study was to determine the presence of endophytic bacteria in *Turbinaria ornata*, *Sargassum crassifolium*, and *Sargassum polycystum* seaweeds and their ability to inhibit the growth of *S. aureus* and *S. epidermidis*.

Seaweed was collected from the sea waters of Panjang Island, Jepara Regency, Central Java, in February 2023. The isolated and purified endophytic bacterial isolates were then challenged against *S. aureus* and *S. epidermidis* bacteria. Three isolates with the highest antibacterial activity were selected to produce antibacterial compounds. Extraction of antibacterial compounds using ethyl acetate solvent to obtain crude extracts of antibacterial compounds. The crude extract samples were used in the antibacterial test using the diffusion method (paper disc method), Minimum Inhibitory Concentration (MIC), and Minimum Bactericidal Concentration (MBC). Identification of the chemical compound groups in the extract was carried out by the Thin Layer Chromatography (TLC) and Gas Chromatography and Mass Spectroscopy (GCMS) methods. Identification of potential endophytic bacterial isolates was carried out using a 16S rRNA gene-based molecular method.

A total of 25 isolates of endophytic bacteria were isolated from 3 species of seaweed, namely 11 isolates from *T. ornata*, 7 isolates from *S. crassifolium*, and 7 isolates from *S. polycystum*. The three isolates with the highest antibacterial activity in the challenge test were isolates To.09.pp, To.10.pp, and Sc.06.pp. Antibacterial test using paper disc method showed inhibition zone diameter (ZOI) 12-35 mm with strong to very strong intensity. The MIC value of To.10.pp isolate extract showed a concentration of 937.5 µg/mL inhibited *S. aureus* and a concentration of 1875 µg/mL inhibited *S. epidermidis*. The MBC value of

To.10.pp isolate extract with a concentration of 1875 µg/mL effectively killed *S. aureus* and a concentration of 1875 µg/mL killed *S. epidermidis*. Identification of chemical compound groups using the TLC method and phytochemicals in the extracts showed that To.10.pp isolate produced flavonoids, alkaloids, and terpenoids. GCMS identification showed 76 peaks on the chromatogram and 11 compound groups. Molecular identification of potential endophytic bacterial isolates, namely To.09.pp isolate has 100% similarity to *Acinetobacter indicus* strain 80-1-2 (100%), To.10.pp isolate has 99.65% similarity to *Vibrio harveyi* strain B14- 1, and isolate Sc.06.pp has a 99% similarity to *Acinetobacter indicus* strain 80-1-2.

Keywords: Antibacterial, Endophytic bacteria, Seaweed, *Staphylococcus aureus*, *Staphylococcus epidermidis*

