

## RINGKASAN

Aktinomisetes merupakan kelompok bakteri yang dapat menghasilkan beragam senyawa bioaktif seperti antibakteri atau antibiotik. *Streptomyces* adalah genus utama aktinomisetes penghasil utama antibiotik. Beberapa isolat bakteri *Streptomyces* spp. telah diisolasi dari lingkungan mangrove Segara Anakan dan diketahui mampu menghambat pertumbuhan bakteri patogen. Kemampuan antibakterinya terhadap *Vibrio cholerae* belum diketahui. *V. cholerae* adalah bakteri patogen yang biasanya mencemari makanan yang bersumber dari laut dan menyebabkan penyakit kolera. *V. cholerae* mengeluarkan enterotoksin di dalam saluran pencernaan, menyebabkan diare dan muntah sehingga menyebabkan kehilangan banyak cairan. Penelitian ini bertujuan untuk mengetahui kemampuan *Streptomyces* spp. asal sedimen mangrove dalam menghambat pertumbuhan bakteri *V. cholerae*, mengetahui kekuatan senyawa antibakteri yang dihasilkan oleh *Streptomyces* spp. terhadap *V. cholerae*, dan mengetahui karakteristik dari senyawa antibakteri yang dihasilkan oleh *Streptomyces* spp.

Penelitian ini dilakukan dengan metode survei selama 5 bulan di Laboratorium Mikrobiologi Fakultas Biologi dan Laboratorium Teknologi Pertanian Universitas Jenderal Soedirman. Tahap penelitian meliputi penapisan isolat bakteri *Streptomyces* spp. (SA34, SA37, SA40, SAE4034) yang menghambat *V. cholerae* pada medium *Starch Casein Nitrate Agar* (SCNA), produksi senyawa antibakteri pada medium *Starch Casein Nitrate Broth* (SCNB), uji aktivitas daya hambat antibakteri dengan metode *Kirby Bauer*, penentuan nilai MIC, pemisahan senyawa antibakteri dengan metode *Thin Layer Chromatography* (TLC), uji fitokimia, uji bioautografi, uji aktivitas senyawa antibakteri pada variasi suhu (40°C, 60°C, 80°C, 100°C) dan pH (2, 4, 6, 9), serta uji konfirmasi karakterisasi bakteri. Data dianalisis secara deskriptif.

Hasil penapisan menunjukkan bahwa penghambatan terhadap pertumbuhan *V. cholerae* tertinggi ditunjukkan oleh isolat SAE4034. Ekstrak kasar mampu menghambat *V. cholerae* dengan diameter zona hambat 11,5-17,5 mm, nilai MIC 30%, dan menghasilkan senyawa bioaktif dengan nilai  $R_f$  berkisar antara 0,31-0,70. Senyawa antibakteri *Streptomyces* sp. SAE4034 yang mampu menghambat pertumbuhan bakteri *V. cholerae* memiliki nilai  $R_f$  0,43 dan senyawa tersebut termasuk golongan alkaloid. Aktivitas senyawa antibakteri *Streptomyces* sp. SAE4034 yang diberi perlakuan suhu 40°C tetap tinggi dengan zona hambat 14 mm dan aktivitas penghambatannya menurun sejalan dengan perlakuan suhu yang lebih tinggi sampai 100°C. Perlakuan pH 6 menunjukkan aktivitas penghambatan tertinggi dengan zona hambat 16 mm, sebaliknya pada pH yang terlalu asam (pH 2 dan 4) atau terlalu basa (pH 9), aktivitas antibakteri ekstrak kasar menurun.

Kata Kunci: antibakteri, pH, *Streptomyces*, suhu, *Vibrio cholerae*.

## SUMMARY

Actinomycetes are a group of bacteria capable of producing a variety of bioactive compounds such as antibacterial or antibiotic. *Streptomyces* is the main genus of antibiotic-producing actinomycetes. Several *Streptomyces* spp. isolates have been isolated from the mangrove environment of Segara Anakan and were known to be able to inhibit the growth of pathogenic bacteria. Its antibacterial ability against *Vibrio cholerae* is not yet known. *V. cholerae* is a bacterial pathogen that usually contaminates seafood and causes cholerae. *V. cholerae* secretes enterotoxins in the digestive tract, causing diarrhea and vomiting, leading to excessive fluid loss. This study aimed to determine the ability of *Streptomyces* spp. origin of mangrove sediments in inhibiting the growth of *V. cholerae* bacteria, to know the inhibitory activity of antibacterial compounds produced by *Streptomyces* spp. against *Vibrio cholerae*, and to know the characteristics of antibacterial compounds produced by *Streptomyces* spp.

This research was conducted using a survey method for 5 months at the Microbiology Laboratory, Faculty of Biology, and Agricultural Technology Laboratory, Jenderal Sudirman University. The research stages included the screening of *Streptomyces* spp. isolates (isolates SA34, SA37, SA40, SAE4034) against *V. cholerae* on Starch Casein Nitrate Agar (SCNA) medium, production of antibacterial compounds on Starch Casein Nitrate Broth (SCNB) medium, test of antibacterial inhibitory activity using Kirby Bauer method, determination of MIC value, separation of antibacterial compounds by *Thin Layer Chromatography* (TLC) and phytochemical methods, bioautography test, treatment of temperature variations (40°C, 60°C, 80°C, 100°C) and pH variations (2, 4, 6, 9) over antibacterial compound activity, and confirmation tests of bacterial characteristics. Data were analyzed descriptively.

The screening results showed that the highest inhibition of the growth of *Vibrio cholerae* was shown by *Streptomyces* sp. SAE4034. The crude extract was able to inhibit *V. cholerae* with an inhibitory zone diameter of 11.5-17.5 mm, MIC value of 30%, and produced compounds with  $R_f$  values ranging from 0.31-0.70. Antibacterial compounds of *Streptomyces* sp. SAE4034 which was able to inhibit the growth of *V. cholerae* bacteria had a  $R_f$  value of 0.43 and the compound belonged to the alkaloid group. The inhibitory activity of *Streptomyces* sp. SAE4034 crude extract treated with temperature of 40°C remained high with an inhibition zone of 14 mm and its inhibitory activity decreased with higher temperature treatment until 100°C. Likewise with the pH treatment, the highest inhibitory activity was obtained at pH 6 with an inhibition zone of 16 mm, on the contrary, at pH that was too acidic (pH 2 and 4) or too alkaline (pH 9), the antibacterial activity of the extract decreased significantly.

Keywords: *antibacterial, pH, Streptomyces, temperature, V. cholerae.*