

RINGKASAN

Pertanian konvensional masih menggunakan bahan kimia sintetik seperti pupuk dan pestisida dalam praktik budidayanya. Penggunaan bahan kimia sintetik dalam waktu jangka panjang akan menyebabkan pencemaran pada tanah. Residu yang ditinggalkan dapat menyebabkan penurunan kualitas tanah yang akan berpengaruh terhadap produksi tanaman. Salah satu jenis residu pencemar adalah logam berat timbal (Pb). Untuk memperbaiki kondisi tanah yang tercemar dapat digunakan bakteri *indigenus*. Bakteri *indigenus* mampu hidup dalam kondisi tercemar karena mempunyai sifat toleransi dan berpotensi sebagai bioremediator. Penelitian ini bertujuan untuk mengisolasi, melakukan uji resistensi dan uji remediasi bakteri *indigenus* pada medium cair dicemari Pb.

Penelitian dilaksanakan pada bulan Desember 2021 hingga Februari 2022 di Laboratorium Agroekologi Fakultas Pertanian Universitas Jenderal Soedirman. Sampel tanah diambil di tiga wilayah Kabupaten Banyumas, yaitu Desa Ajibarang Kulon, Desa Menganti, dan Desa Pesawahan. Tahapan penelitian meliputi pengambilan sampel, pengukuran pH tanah, pengenceran sample tanah hingga 10^{-8} , penghitungan jumlah dan pengamatan morfologi koloni, isolasi bakteri, pewarnaan gram dan endospora, pengujian kurva pertumbuhan, resistensi, dan remediasi.

Kadar pH di tiga wilayah pengambilan sampel tergolong asam menggunakan metode KCl, dan basa menggunakan metode H₂O. Hasil isolasi dari tiga wilayah diperoleh lima isolat bakteri dominan, yaitu AB1, AB3, MT1, MT2, dan PSW1. Berdasarkan karakteristik morfologi koloni, kelima isolat mempunyai bentuk bundar dan elevasi datar. Berdasarkan pewarnaan gram, isolat AB1, AB3, MT1, dan PSW1 merupakan gram positif, sedangkan isolat MT2 merupakan bakteri gram negatif. Kelima isolat memiliki kemampuan membentuk endospora. Pengamatan kurva pertumbuhan pada medium NB tanpa cemaran Pb menunjukkan waktu generasi isolat paling baik adalah AB1, yaitu 1 jam 9 menit. Uji kurva pertumbuhan di medium cair yang diperkaya Pb 50 ppm menunjukkan bahwa isolat AB1 mempunyai kemampuan resisten tertinggi. Uji resistensi pada medium NA yang diperkaya Pb hingga 100 ppm menunjukkan bahwa isolat AB1 juga mempunyai kemampuan resisten tertinggi. Uji remediasi timbal pada medium NB cair yang diperkaya Pb 49,97 ppm menunjukkan bahwa isolat AB3 mempunyai hasil reduksi tertinggi dengan total penurunan logam berat sebesar 8,10%.

Kata kunci: isolasi, resistensi, remediasi, timbal

SUMMARY

Conventional agriculture still uses synthetic chemicals such as fertilizers and pesticides in its cultivation practices. The use of synthetic chemicals in the long term will cause pollution to the soil. The residue left behind can cause a decrease in soil quality which will affect plant productivity. One type of pollutant residue is heavy metal lead (Pb). To improve the condition of polluted soil, indigenous bacteria can be used. Indigenous bacteria are able to live in polluted conditions because they have tolerance properties and have potential as bioremediators. This study aims to isolate, test resistance and test remediation of indigenous bacteria in liquid medium contaminated with Pb.

The research was carried out from December 2021 to February 2022 at the Agroecology Laboratory, Faculty of Agriculture, Jenderal Sudirman University. Soil samples were taken in three areas of Banyumas Regency, namely Ajibarang Kulon Village, Menganti Village, and Pesawahan Village. The research stages included sampling, measuring soil pH, dilution of soil samples to 10⁻⁶, counting the number and observing colony morphology, isolation of bacteria, gram staining and endospores, testing growth curves, resistance, and remediation.

The pH levels in the three sampling areas were classified as acidic using the KCl method, and alkaline using the H₂O method. The results of the isolation from three regions obtained five dominant bacterial isolates, namely AB1, AB3, MT1, MT2, and PSW1. Based on the morphological characteristics of the colonies, the five isolates had a round shape and flat elevation. Based on gram staining, isolates AB1, AB3, MT1, and PSW1 were gram-positive, while isolates MT2 were gram-negative bacteria. The five isolates had the ability to form endospores. Observation of the growth curve on NB without Pb contamination showed that the best isolate generation time was AB1, which was 1 hour 9 minutes. Growth curve test in 50 ppm Pb-enriched liquid medium showed that AB1 isolate had the highest resistance ability. Resistance test on NA medium enriched with Pb up to 100 ppm showed that AB1 isolate also had the highest resistance ability. Lead remediation test on liquid NB medium enriched with Pb 49.97 ppm showed that AB3 isolate had the highest reduction result with a total reduction of heavy metals of 8.10%.

Keywords: isolation, resistance, remediation, lead