

RINGKASAN

Kandungan logam berat kadmium (Cd) di dalam tanah disebabkan oleh berbagai aktivitas manusia dan dapat berpengaruh pada pertumbuhan tanaman. Tanaman pakcoy dapat mengakumulasi Cd pada daun, batang, dan akar. Proses pemulihan lahan seperti tercemar limbah organik maupun limbah anorganik dapat menggunakan mikroorganisme dan bahan organik seperti biochar. Penelitian ini bertujuan untuk mengetahui pengaruh aplikasi isolat bakteri resisten Cd dan biochar terhadap kandungan Cd tanah dan tanaman serta pertumbuhan dan hasil tanaman pakcoy.

Penelitian dilaksanakan di *screenhouse* Desa Kebanggan Kecamatan Sumbang Kabupaten Banyumas pada bulan Agustus – Desember 2023 dan Laboratorium Agroekologi, Laboratorium Agronomi dan Hortikultura Fakultas Pertanian, Laboratorium Riset Universitas Jenderal Soedirman serta Wahana Laboratorium Semarang. Penelitian ini merupakan penelitian eksperimental dengan perlakuan faktorial 3x3 yang disusun ke dalam Rancangan Acak Kelompok (RAK) dengan 3 ulangan. Faktor pertama adalah isolat bakteri resisten Cd yang terdiri atas tanpa isolat, konsorsium isolat BR₂ dan SJ₃, serta konsorsium isolat BR₂ dan CR₁. Faktor kedua adalah biochar yang terdiri atas biochar 11,25 g, 22,5 g, dan 33,75 g. Variabel yang diamati meliputi kandungan Cd tanah, kandungan Cd tanaman, pH tanah, jumlah populasi bakteri, tinggi tanaman, jumlah daun, luas daun, kandungan klorofil tanaman, dan bobot segar tanaman. Data hasil percobaan dianalisis menggunakan analisis ragam ANOVA kemudian uji lanjut *Duncan Multiple Range Test* (DMRT) pada taraf kepercayaan 95% jika data menunjukkan adanya pengaruh nyata.

Hasil penelitian menunjukkan bahwa aplikasi isolat bakteri dan biochar secara tunggal memberikan pengaruh terhadap kandungan Cd tanah, kandungan Cd tanaman, jumlah populasi bakteri, pH tanah, kandungan klorofil total, luas daun, dan bobot tanaman segar. Kombinasi aplikasi isolat bakteri dan biochar mampu menurunkan kandungan Cd tanaman dan meningkatkan luas daun. Kombinasi isolat bakteri dan biochar terbaik ditunjukkan oleh konsorsium isolat BR₂ dan CR₁ dengan pemberian biochar 33,75 g/polybag. Perlakuan tersebut memiliki kandungan Cd tanaman terendah 0,03 ppm dan menurunkan kandungan Cd tanaman 72% dibandingkan perlakuan tanpa isolat bakteri dan biochar. Pengaplikasian konsorsium isolat BR₂ dan CR₁ menurunkan kandungan Cd tanah 14% dibandingkan perlakuan tanpa isolat bakteri.

Kata kunci: bakteri, biochar, Cd, pakcoy, resisten

SUMMARY

Cadmium (Cd) heavy metal content in soil is caused by various human activities and can affect plant growth. Pakcoy plants can accumulate Cd in leaves, stems, and roots. The process of restoring land such as polluted organic waste and inorganic waste can use microorganisms and organic materials such as biochar. This study aims to determine the effect of the application of Cd-resistant bacterial isolates and biochar on soil and plant Cd content as well as the growth and yield of pakcoy plants.

The research was conducted in the screenhouse of Kebanggan Village, Sumbang Subdistrict, Banyumas Regency in August - December 2023 and Agroecology Laboratory, Agronomy and Horticulture Laboratory, Faculty of Agriculture, Research Laboratory of Jenderal Soedirman University and Semarang Wahana Laboratory. This research was an experimental research with 3x3 factorial treatment arranged into a Randomized Block Design (RBD) with 3 replications. The first factor was Cd-resistant bacterial isolates consisting of no isolate, a consortium of BR₂ and SJ₃ isolates, and a consortium of BR₂ and CR₁ isolates. The second factor was biochar consisting of 11.25 g, 22.5 g, and 33.75 g biochar. The observed variables included soil Cd content, plant Cd content, soil pH, bacterial population, plant height, leaf number, leaf area, plant chlorophyll content, and plant fresh weight. The experimental data was analysed using ANOVA analysis of variance and then Duncan Multiple Range Test (DMRT) further test at 95% confidence level if the data showed a significant effect.

The results showed that the application of bacterial isolates and biochar singly influenced soil Cd content, plant Cd content, total bacterial population, soil pH, total chlorophyll content, leaf area, and fresh plant weight. The combination of bacterial isolate and biochar application can reduce plant Cd content and increase leaf area. The best combination of bacterial isolates and biochar was shown by the consortium of BR₂ and CR₁ isolates with 33.75 g/polybag biochar. The treatment had the lowest plant Cd content of 0.03 ppm and reduced plant Cd content by 72% compared to the treatment without bacterial isolates and biochar. Application of the consortium of BR₂ and CR₁ isolates reduced soil Cd content by 14% compared to the treatment without bacterial isolates.

Keywords: bacteria, biochar, Cd, pakcoy, resistant