

RINGKASAN

Upaya mengurangi Cd di tanah pertanian dan akumulasi Cd di produk pertanian menjadi sangat penting dilakukan sebagai akibat budidaya pertanian intensif dan berbagai aktivitas di luar bidang pertanian. Tujuan penelitian adalah mengetahui pengaruh aplikasi konsorsium isolat bakteri, dosis biochar dan kombinasi keduanya terhadap kadar Cd tanah dan tanaman serta pertumbuhan dan hasil tanaman pakcoy.

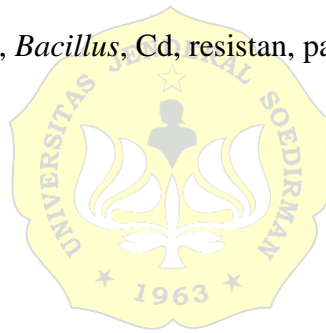
Penelitian ini dilaksanakan pada bulan Agustus hingga November 2023 di *Screenhouse* Desa Kebanggan Kecamatan Sumbang Kabupaten Banyumas dan dilakukan analisis di Laboratorium Agroekologi Fakultas Pertanian Unsoed, Laboratorium Tanah dan Sumberdaya Lahan Fakultas Pertanian Unsoed, Laboratorium Riset Unsoed, serta Wahana Laboratorium Semarang. Metode yang digunakan dalam penelitian ini adalah Rancangan Acak Kelompok (RAK) faktorial dengan 2 faktor. Faktor pertama adalah perlakuan konsorsium bakteri yang terdiri dari perlakuan tanpa isolat bakteri, konsorsium isolat SJ3 dan CR1, dan konsorsium isolat BR2, SJ3 dan CR1. Faktor kedua adalah aplikasi biochar yang terdiri dari dosis 11,25 g, 22,5 g, dan 33,75 g. Variabel yang diamati meliputi kadar awal dan akhir Cd tanah, kadar Cd pada tanaman pakcoy, jumlah populasi bakteri, kadar klorofil total, tinggi tanaman, jumlah daun, luas daun dan bobot segar tanaman pakcoy. Data hasil penelitian dianalisis menggunakan uji ANOVA kemudian uji lanjut Duncan (DMRT = *Duncan Multiple Range Test*) dengan taraf kepercayaan 95% jika data menunjukkan adanya pengaruh nyata dan dianalisis regresi untuk mengetahui *trend* pengaruh dari biochar.

Perlakuan konsorsium isolat bakteri berpengaruh nyata terhadap variabel kadar Cd tanah, kadar Cd tanaman dan kadar klorofil total. Namun, berpengaruh tidak nyata terhadap variabel tinggi tanaman, jumlah daun, luas daun dan bobot segar tanaman pakcoy. Perlakuan dosis biochar berpengaruh nyata terhadap kadar Cd tanah, kadar Cd tanaman dan berpengaruh tidak nyata terhadap variabel pertumbuhan dan hasil tanaman pakcoy yang meliputi kadar klorofil total, tinggi tanaman, jumlah daun, luas daun dan bobot segar pakcoy.

Perlakuan konsorsium isolat bakteri BR2, SJ3 dan CR1 memiliki signifikansi paling tinggi terhadap kadar Cd tanah, kadar Cd tanaman, dan kadar klorofil total. Perlakuan tanpa isolat bakteri tidak mampu menurunkan kadar Cd tanah, perlakuan M1 (SJ3 dan CR1) menurunkan Cd tanah 13,72% sedangkan perlakuan M2 (SJ3, CR1, dan BR2) menurunkan Cd tanah 45,09%. Akumulasi kadmium pada tanaman pakcoy terendah ditunjukkan oleh perlakuan M2 (SJ3, CR1 dan BR2), yaitu 0,01 ppm dan kadar klorofil total ditunjukkan oleh perlakuan M2 (SJ3, CR1 dan BR2) yaitu 5,40 mg/L.

Perlakuan biochar dengan dosis 33,75 g memiliki signifikansi paling tinggi terhadap kadar Cd tanah dan kadar Cd tanaman. Kadar Cd tanah dan tanaman terendah ditunjukkan oleh perlakuan biochar dosis 33,75 g, yaitu 0,39 ppm dalam tanah dan 0,06 ppm dalam tanaman pakcoy.

Kata kunci: bakteri, biochar, *Bacillus*, Cd, resistan, pakcoy



SUMMARY

Efforts to reduce Cd in agricultural soil and Cd accumulation in agricultural products are crucial due to intensive farming practices and various non-agricultural activities. The research aims to investigate the effects of a consortium of bacterial isolates, biochar dosage, and their combination on soil and plant Cd levels as well as the growth and yield of pakchoi plants.

The study was conducted from August to November 2023 at the Screenhouse in Kebanggan Village, Sumbang District, Banyumas Regency, with analyses performed at the Agroecology Laboratory of the Faculty of Agriculture at Unsoed, the Soil and Land Resources Laboratory of the Faculty of Agriculture at Unsoed, Unsoed Research Laboratory, and Semarang Laboratory Facility. The research employed a factorial Randomized Complete Block Design with 2 factors. The first factor comprised bacterial consortium treatments, including no bacterial isolates, SJ3 and CR1 isolate consortium, and BR2, SJ3, and CR1 isolate consortium. The second factor involved biochar applications with dosages of 11,25 g, 22,5 g, and 33,75 g. Observed variables included initial and final soil Cd levels, Cd levels in pakchoi plants, bacterial population count, total chlorophyll content, plant height, leaf count, leaf area, and fresh weight of pakchoi plants. The research data were analyzed using ANOVA followed by Duncan's multiple range test (DMRT) at a 95% confidence level if significant effects were observed, and regression analysis was conducted to determine the trend of biochar effects.

Consortium bacterial treatments significantly influenced soil Cd levels, Cd levels in plants, and total chlorophyll content. However, they did not significantly affect plant height, leaf count, leaf area, or fresh weight of pakchoi plants. Biochar dosage treatments significantly affected soil Cd levels and Cd levels in plants but did not significantly influence the growth and yield variables of pakchoi plants, including total chlorophyll content, plant height, leaf count, leaf area, and fresh weight. The BR2, SJ3, and CR1 bacterial isolate consortium treatment showed the highest significance for soil Cd levels, Cd levels in plants, and total chlorophyll content.

The treatment without bacterial isolates failed to decrease soil Cd levels, while the M1 treatment (SJ3 and CR1) reduced soil Cd levels by 13,72%, and the M2 treatment (SJ3, CR1, and BR2) reduced soil Cd levels by 45,09%. The lowest cadmium accumulation in pakchoi plants was demonstrated by the M2 treatment (SJ3, CR1, and BR2), at 0,01 ppm, and the total chlorophyll content was shown by the M2 treatment (SJ3, CR1, and BR2), at 5,40 mg/L.

The biochar treatment with a dosage of 33,75 g showed the highest significance for soil Cd levels and Cd levels in plants. The lowest soil and plant Cd levels were indicated by the biochar treatment with a dosage of 33,75 g, at 0,39 ppm in soil and 0,06 ppm in pakchoi plants.

Keywords: bacteria, biochar, Bacillus, Cd, resistant, pakchoi

