

## RINGKASAN

Pencemaran logam berat pada lahan pertanian disebabkan oleh aktivitas industri (peleburan logam, pemrosesan baterai), penggunaan pupuk fosfat dan pestisida kimia sintetis dalam jangka waktu yang panjang. Residu logam berat akan terakumulasi pada komoditas yang dibudidayakan pada lahan pertanian dan masuk kedalam rantai makanan. Pakcoy merupakan tanaman yang mampu mengakumulasi Cd karena memiliki biomassa yang cukup besar sehingga semakin besar pula kemampuannya dalam menyerap logam berat pada tanah. Kadmium (Cd) merupakan unsur logam berat yang berpotensi buruk terhadap tanaman dengan menghambat penyerapan unsur hara, menghambat distribusi fotosintat, menghambat fotosintesis, aktivitas enzim. Upaya untuk mengurangi tingkat cemaran kadmium pada lahan pertanian dapat dilakukan melalui bioremediasi menggunakan mikroba yang resisten Cd, remediasi dengan pembenah tanah biochar dan bahan organik seperti asam humat. Penelitian ini bertujuan untuk menentukan dosis biochar dan asam humat terhadap penurunan kandungan kadmium dalam tanah serta pertumbuhan dan hasil tanaman pakcoy.

Penelitian dilaksanakan di *Screenhouse* Desa Kebanggan Kecamatan Sumbang Kabupaten Banyumas dari bulan Agustus 2023 hingga bulan Januari 2024. Analisis dilakukan di Wahana Laboratorium Semarang, Laboratorium Agroekologi, Laboratorium Tanah dan Sumberdaya Lahan Fakultas Pertanian Unsoed. Penelitian ini menggunakan Rancangan Acak Kelompok Non Faktorial yang terdiri dari 9 perlakuan dan setiap perlakuan dilakukan pengulangan sebanyak 3 kali dengan perlakuan yang diberikan adalah dosis biochar dan asam humat, yaitu AB1 = Biochar 5 ton/ha dan asam humat 10 kg/ha, AB2 = Biochar 10 ton/ha dan asam humat 10 kg/ha, AB3 = Biochar 15 ton/ha dan asam humat 10 kg/ha, AB4 = Biochar 5 ton/ha dan asam humat 20 kg/ha, AB5 = Biochar 10 ton/ha dan asam humat 20 kg/ha, AB6 = Biochar 15 ton/ha dan asam humat 20 kg/ha, AB7 = Biochar 5 ton/ha dan asam humat 30 kg/ha, AB8 = Biochar 10 ton/ha dan asam humat 30 kg/ha, AB9 = Biochar 15 ton/ha dan asam humat 30 kg/ha. Variabel yang diamati yaitu kandungan kadmium dalam tanah dan tanaman jumlah bakteri total, tinggi tanaman, jumlah daun, luas daun, bobot basah tanaman dan kandungan klorofil daun. Data hasil penelitian dianalisis menggunakan analisis ragam ANOVA kemudian uji lanjut *Duncan Multiple Range Test* (DMRT) pada taraf kesalahan 5% jika data menunjukkan adanya pengaruh nyata.

Hasil penelitian menunjukkan bahwa aplikasi biochar dan asam humat dosis 15 ton/ha dan 30 kg/ha mampu menurunkan kandungan kadmium dalam tanah dengan persentase sebesar 39,53%. Pada tanaman pakcoy terdapat kandungan logam berat sebesar 0,08 ppm yang terakumulasi pada jaringan tanaman. Aplikasi biochar 15 ton/ha dan asam humat 30 kg/ha mampu meningkatkan presentase pertumbuhan dan hasil tanaman pakcoy yaitu tinggi tanaman sebesar 10,14%, jumlah daun sebesar 30%, luas daun sebesar 37,36%, bobot basah sebesar 20,75% dan kadar klorofil total sebesar 132,1%.

Kata kunci: Kadmium, Pakcoy, Biochar, Asam humat

## SUMMARY

Heavy metal pollution of agricultural land is caused by industrial activities (metal smelting, battery processing), long-term use of phosphate fertilizers and synthetic chemical pesticides. Heavy metal residues will accumulate in commodities cultivated on agricultural land and enter the food chain. Pakcoy is a plant that is able to accumulate Cd because it has a large enough biomass so that the greater its ability to absorb heavy metals in the soil. Cadmium (Cd) is a heavy metal element that has the potential to adversely affect plants by inhibiting nutrient absorption, inhibiting photosynthate distribution, inhibiting photosynthesis, enzyme activity. Efforts to reduce the level of cadmium contamination on agricultural land can be done through bioremediation using Cd-resistant microbes, remediation with biochar soil improver and organic materials such as humic acid. This study aims to determine the dose of biochar and humic acid to reduce cadmium content in soil as well as the growth and yield of pakcoy plants.

The research was conducted at the Screenhouse of Kebanggan Village, Sumbang Subdistrict, Banyumas Regency from August 2023 to January 2024. Analyses were conducted at Wahana Laboratorium Semarang, Agroecology Laboratory, Soil and Land Resources Laboratory, Faculty of Agriculture, Unsoed. This study used a Non-Factorial Randomized Group Design consisting of 9 treatments and each treatment was repeated 3 times with the treatment given was the dose of biochar and humic acid, namely AB1 = Biochar 5 tons/ha and humic acid 10 kg/ha, AB2 = Biochar 10 tons/ha and humic acid 10 kg/ha, AB3 = Biochar 15 tons/ha and humic acid 10 kg/ha, AB4 = Biochar 5 tons/ha and humic acid 20 kg/ha, AB5 = Biochar 10 tons/ha and humic acid 20 kg/ha, AB6 = Biochar 15 tons/ha and humic acid 20 kg/ha, AB7 = Biochar 5 tons/ha and humic acid 30 kg/ha, AB8 = Biochar 10 tons/ha and humic acid 30 kg/ha, AB9 = Biochar 15 tons/ha and humic acid 30 kg/ha. The observed variables were cadmium content in soil and total bacterial count, plant height, number of leaves, leaf area, plant wet weight and leaf chlorophyll content. The data were analyzed using ANOVA analysis of variance and then Duncan Multiple Range Test (DMRT) further test at 5% error level if the data showed a real effect.

The results showed that the application of biochar and humic acid doses of 15 tons/ha and 30 kg/ha was able to reduce the cadmium content in the soil with a percentage of 39.53%. In pakcoy plants there is a heavy metal content of 0.08 ppm which accumulates in plant tissues. The application of biochar 15 tons/ha and humic acid 30 kg/ha was able to increase the percentage of growth and yield of pakcoy plants, namely plant height by 10.14%, number of leaves by 30%, leaf area by 37.36%, wet weight by 20.75% and total chlorophyll content by 132.1%.

*Keywords: Cadmium, Pakcoy, Biochar, Humic acid*