

AKTIVITAS SUPEROKSIDA DISMUTASE DAN NITRAT REDUKTASE KRISAN (*Chrysanthemum morifolium Ramat.*) PASCA APLIKASI *BIOFERTILIZER* PADA MEDIA MENGANDUNG RESIDU KLORPIRIFOS

Delia Sawanda Syarifatullah
22/498031/BI/11032

Pembimbing : Dr. Dwi Umi Siswanti, S.Si., M.Sc.

INTISARI

Krisan (*Chrysanthemum morifolium*) merupakan tanaman hias komersial yang memiliki siklus hidup relatif pendek dan rentan terhadap serangan insekta. *Biofertilizer* mengandung mikroorganisme hidup yang berfungsi meningkatkan ketersediaan hara serta mendukung pertumbuhan tanaman sekaligus berpotensi sebagai agen bioremediasi untuk menurunkan residu logam berat dan bahan kimia berbahaya. Penelitian ini bertujuan menganalisis respons fisiologis dan biokimia tanaman krisan terhadap penambahan *biofertilizer* pada media yang mengandung residu insektisida organofosfat, serta mengevaluasi efektivitas *biofertilizer* dalam menurunkan residu pada tanah. Tanaman yang digunakan adalah *C. morifolium* var. Puspita Nusantara dengan insektisida organofosfat Dursban 200EC sebagai sumber residu Pb. Penelitian dilaksanakan dengan tiga dosis *biofertilizer* (10, 15, dan 20 L/Ha) serta kontrol. Analisis fisiologis dilakukan di Laboratorium Biokimia, Fasilitas Penelitian Bersama Fakultas Biologi, dan Balai Penerapan dan Modernisasi Pertanian DIY. Parameter yang diamati meliputi kondisi lingkungan, pertumbuhan dan produktivitas tanaman, kadar klorofil, Aktivitas Nitrat Reduktase (ANR), kandungan Superoksida Dismutase (SOD), serta kadar Pb pada tanah. Hasil penelitian menunjukkan bahwa akumulasi Pb pada media tanam berada pada kisaran 53–63 ppm dan masih berada dalam batas aman berdasarkan Peraturan Pemerintah Nomor 101 Tahun 2014, batas aman kadar logam Pb di tanah pertanian yaitu dibawah 300 mg/kg. *Biofertilizer*, terutama pada dosis 10 L/Ha, efektif menurunkan residu Pb dari insektisida organofosfat. Selain itu, respons fisiologis tanaman memperlihatkan peningkatan tinggi tanaman, jumlah daun dan bunga, biomassa akar dan tajuk, serta nilai ANR pada perlakuan *biofertilizer* dengan dosis optimal 15 L/Ha. Kandungan SOD berkorelasi positif dengan kadar Pb, yaitu lebih tinggi pada perlakuan organofosfat akibat stres oksidatif yang lebih besar.

Kata Kunci: *Biofertilizer*, bioremediasi, insektisida organofosfat, krisan

SUPEROXIDE DISMUTASE AND NITRATE REDUCTASE ACTIVITY IN CHRYSANTHEMUM (*Chrysanthemum morifolium* Ramat.) AFTER APPLICATION OF BIOFERTILIZER IN MEDIA CONTAINING CHLORPYRIFOS RESIDUE

Delia Sawanda Syarifatullah
22/498031/BI/11032

Supervisor : Dr. Dwi Umi Siswanti, S.Si., M.Sc.

ABSTRACT

Chrysanthemum (*Chrysanthemum morifolium*) is a commercial ornamental plant with a relatively short life cycle and high susceptibility to insect attacks. Biofertilizers contain living microorganisms that function to increase nutrient availability and support plant growth, while also having potential as bioremediation agents to reduce heavy metal residues and harmful chemical compounds. This study aims to analyze the physiological and biochemical responses of chrysanthemum plants to the application of biofertilizer in media containing organophosphate insecticide residues and to evaluate the effectiveness of the biofertilizer in reducing residues in the soil. The plant used was *C. morifolium* var. Puspita Nusantara, with the organophosphate insecticide Dursban 200EC as the source of Pb residues. The experiment was conducted using three biofertilizer doses (10, 15, and 20 L/ha) along with controls. Physiological analyses were carried out at the Biochemistry Laboratory, the Shared Research Facilities of the Faculty of Biology, and the Agricultural Modernization and Implementation Center of Yogyakarta Special Region. Observed parameters included environmental conditions, plant growth and productivity, chlorophyll content, Nitrate Reductase Activity (NRA), Superoxide Dismutase (SOD) content, and Pb levels in the soil. The results demonstrated that Pb accumulation in the growing media ranged from 53–63 ppm, which remains within the safe limit according to Government Regulation No. 101 of 2014, where the permissible Pb concentration in agricultural soils is below 300 mg/kg. Biofertilizer particularly at a dose of 10 L/ha—was effective in reducing Pb residues derived from organophosphate insecticides. Additionally, the physiological responses of the plants showed improvements in plant height, number of leaves and flowers, root and shoot biomass, and NRA values under biofertilizer treatments, with an optimal dose of 15 L/ha. SOD levels were positively correlated with Pb concentrations, being higher under organophosphate treatments due to greater oxidative stress.

Key Words: biofertilizer, bioremediation, chrysanthemum, organophosphate insecticide