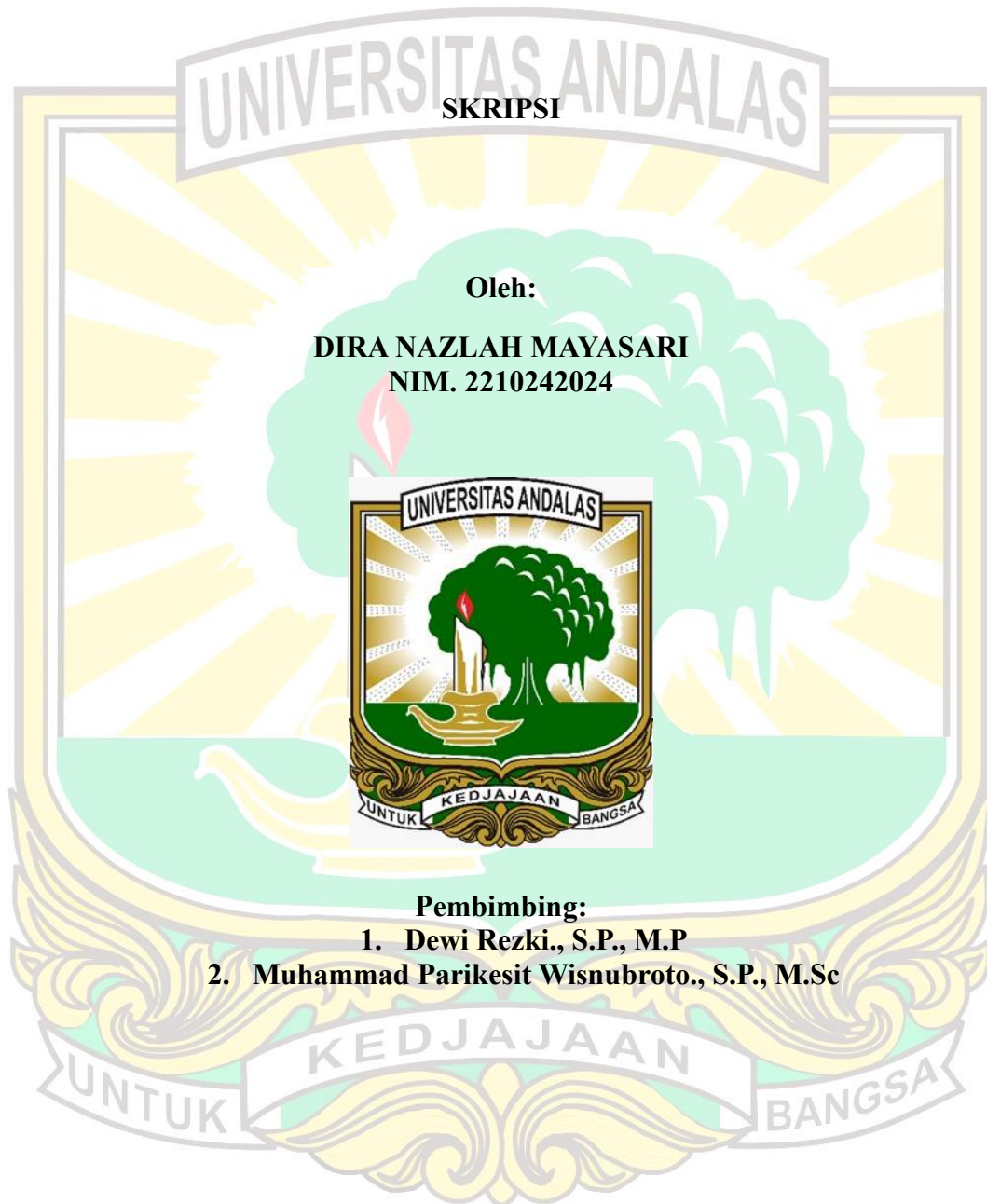


**RESPON BIOKIMIA DAN AGRONOMI BIBIT KOPI ROBUSTA
(*Coffea canephora*) TERHADAP APLIKASI BIOCHAR YANG
DIPERKAYA Zn DENGAN Si DI BAWAH
CEKAMAN KEKERINGAN**



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RESPON BIOKIMIA DAN AGRONOMI BIBIT KOPI ROBUSTA (*Coffea canephora*) TERHADAP APLIKASI BIOCHAR YANG DIPERKAYA Zn DENGAN Si DI BAWAH CEKAMAN KEKERINGAN

Abstrak

Cekaman kekeringan merupakan salah satu faktor pembatas pertumbuhan bibit kopi robusta (*Coffea canephora*) karena memicu gangguan biokimia dan stres oksidatif. Biochar diperkaya seng (Zn) dan silika (Si) berpotensi meningkatkan adaptabilitas bibit melalui perbaikan media tumbuh dan pertahanan biokimia. Penelitian ini bertujuan menganalisis pengaruh interaksi dosis biochar diperkaya Zn-Si dan interval penyiraman terhadap respons biokimia dan agronomi bibit kopi robusta serta menentukan dosis terbaik. Penelitian dilaksanakan pada September 2025–Februari 2026 di Lahan Percobaan Kampus III Universitas Andalas, Dharmasraya, menggunakan Rancangan Acak Lengkap (RAL) faktorial dengan dosis biochar diperkaya Zn-Si (0, 100, 200, 300, dan 400 g polybag⁻¹) dan interval penyiraman (1, 3, 5, dan 7 hari), dengan tiga ulangan. Data biokimia dianalisis secara deskriptif menggunakan sampel komposit, sedangkan data agronomi dianalisis menggunakan ANOVA dan uji lanjut DMRT pada taraf kepercayaan 95%. Hasil menunjukkan bahwa perlakuan biochar diperkaya Zn-Si dan interval penyiraman berinteraksi nyata terhadap jumlah daun, bobot kering tajuk, bobot kering akar, dan rasio tajuk akar. Respons biokimia terbaik pada kondisi cekaman diperoleh pada dosis 200 g polybag⁻¹ dengan interval penyiraman 3 hari sekali. Dosis 200 g polybag⁻¹ dengan penyiraman 3 hari sekali berpotensi meningkatkan efisiensi penggunaan air dan adaptasi bibit kopi robusta terhadap cekaman kekeringan, sehingga berpotensi diterapkan sebagai alternatif teknologi budidaya pada fase pembibitan untuk mendukung produksi bibit berkualitas dalam menghadapi risiko kekeringan akibat perubahan iklim.

Kata Kunci: Antioksidan, cekaman oksidatif, enzimatik, peroksidasi lipid, peroksida

BIOCHEMICAL AND AGRONOMIC RESPONSES OF ROBUSTA COFFEE SEEDLINGS (*Coffea canephora*) TO THE APPLICATION OF Zn- AND Si-ENRICHED BIOCHAR UNDER DROUGHT STRESS

Abstract

Drought stress is a major limiting factor affecting the growth of robusta coffee seedlings (*Coffea canephora*) by inducing biochemical disturbances and oxidative stress. Biochar enriched with zinc (Zn) and silicon (Si) has the potential to improve seedling adaptability by improving growing media properties and enhancing biochemical defense mechanisms. This study aimed to analyze the interaction between biochar enriched with Zn-Si doses and watering intervals on the biochemical and agronomic responses of robusta coffee seedlings and to determine the best treatment. The study was conducted from September 2025 to February 2026 at the Experimental Field of Campus III, Universitas Andalas, Dharmasraya, using a factorial Completely Randomized Design (CRD) with five biochar doses (0, 100, 200, 300, and 400 g polybag⁻¹) and four watering intervals (1, 3, 5, and 7 days), with three replications. Biochemical data were analyzed descriptively using composite samples, while agronomic data were analyzed using analysis of variance (ANOVA) followed by Duncan's Multiple Range Test (DMRT) at a 95% confidence level. The results showed significant interactions between biochar dose and watering interval on leaf number, shoot dry weight, root dry weight, and shoot-to-root ratio. The best biochemical response under drought stress was obtained with 200 g polybag⁻¹ biochar combined with a three-day watering interval. This treatment has the potential to improve water use efficiency and seedling adaptation to drought stress and may serve as an alternative cultivation technology during the nursery stage to support high-quality seedling production under increasing drought risks associated with climate change.

Keywords: Antioxidants, enzymatic, lipid peroxidation, oxidative stress, peroxide