

RINGKASAN

Kopi robusta memiliki produksi jenis kopi tertinggi di Indonesia dengan produksi kopi robusta sebesar 90% (Hariance *et al.*, 2015). Tanaman kopi robusta memiliki syarat tumbuh adalah tinggi tempat (0-1.000) mdpl dengan ketinggian optimal (400-800) mdpl, suhu 21-24°C (Hanafi *et al.*, 2019). Curah hujan optimal untuk tanaman kopi 1.500 – 3.000 mm/tahun (Al Mahbubah *et al.*, 2015). Salah satu permasalahan kopi adalah terlalu banyak penggunaan pupuk anorganik dan kurangnya penggunaan pupuk organik serta pembenah tanah yang dapat membuat tanah menjadi keras. Tanah keras akan membuat mikroorganisme dalam tanah tidak dapat hidup dan tidak dapat menahan air dan udara yang optimal yang membuat tanah tidak subur. Penelitian ini bertujuan mengetahui pengaruh pemberian biochar dan *ecoenzyme* dengan berbagai dosis terhadap morfologi dan fisiologi tanaman kopi, mengetahui interaksi antara pemberian biochar dan *ecoenzyme* untuk morfologi dan fisiologi tanaman kopi, mengetahui kombinasi terbaik antara biochar dan *ecoenzyme* terhadap morfologi dan fisiologi tanaman kopi. Penelitian diharapkan dapat berpengaruh nyata terhadap morfologi dan fisiologi tanaman kopi robusta.

Penelitian ini dilakukan di Desa Sunyalangu, Kecamatan Karanglewas, Kabupaten Banyumas dengan lahan kopi seluas 5.000 m² dengan menggunakan kopi 5-10 tahun dengan jarak tanam 2,5 x 2,5 m pada ketinggian 700 mdpl. Analisis fisiologi dilakukan di Laboratorium Agronomi dan Hortikultura Fakultas Pertanian Universitas Jenderal Soedirman. Penelitian dilaksanakan mulai dari November 2024 sampai Mei 2025. Metode Penelitian yang digunakan pada penelitian ini menggunakan metode percobaan dengan rancangan acak kelompok dua faktorial dengan 3 ulangan. Faktor yang akan dicoba dalam penelitian ini yaitu: faktor satu biochar yang terdiri dari tanpa biochar (B₀), 200 g biochar (B₁), 300 g biochar (B₂). Faktor dua *ecoenzyme* yang terdiri dari tanpa *ecoenzyme* (E₁), 50 ml/L *ecoenzyme* (E₁), 100 ml/L *ecoenzyme* (E₂). Kombinasi kedua faktor tersebut diperoleh 9 kombinasi dengan 3 ulangan 1 tanaman sehingga didapatkan 27 unit percobaan. Variabel pengamatan pada tanaman kopi meliputi karakter morfologi dan fisiologi tanaman kopi robusta. Variabel morfologi meliputi tinggi tanaman (cm), diameter batang (cm), jumlah daun (helai). Variabel fisiologi meliputi Indeks luas daun (cm²/m²), kehijauan daun (unit), kerapatan stomata (mm²), lebar bukaan stomata (µm), kandungan klorofil (mg/L), kadar air relatif daun (%), Laju pertumbuhan (cm/hari).

Hasil penelitian menunjukkan bahwa faktor pemberian biochar berpengaruh nyata terhadap pertambahan tinggi tanaman (cm), diameter batang (cm) dan laju pertumbuhan (cm/hari). Faktor pemberian *ecoenzyme* berpengaruh nyata terhadap variabel jumlah daun (helai), kandungan klorofil (mg/L) dan kadar air relatif daun (%). Terdapat interaksi antara kombinasi perlakuan biochar dengan *ecoenzyme* pada variabel tinggi tanaman.

SUMMARY

Robusta coffee has the highest production of coffee in Indonesia, with robusta coffee production accounting for 90% (Hariance et al., 2015). Robusta coffee plants require an altitude of 0–1,000 meters above sea level (masl), with an optimal altitude of 400–800 masl, and a temperature of 21–24°C (Hanafi et al., 2019). The optimal rainfall for coffee plants is 1,500–3,000 mm/year (Al Mahbubah et al., 2015). One of the issues with coffee is the excessive use of inorganic fertilizers and insufficient use of organic fertilizers and soil conditioners, which can lead to soil compacted. Compacted soils hinder the activity of soil microorganisms and reduce the soil's ability to retain water and air, ultimately resulting in decreased soil fertility. This study aims to determine the effect of biochar and ecoenzyme application at various doses on the morphology and physiology of coffee plants, to understand the interaction between biochar and ecoenzyme application on the morphology and physiology of coffee plants, and to identify the best combination of biochar and ecoenzyme for the morphology and physiology of coffee plants. The study is expected to have a significant impact on the morphology and physiology of Robusta coffee plants.

The study was conducted in Sunyalangu Village, Karanglewas Subdistrict, Banyumas District, on a 5,000 m² coffee plantation with 5 – 10 years a planting distance of 2.5 x 2.5 m at an elevation of 700 m above sea level. Physiological analysis was performed at the Agronomy and Horticulture Laboratory of the Faculty of Agriculture, Jenderal Soedirman University. The study was conducted from November 2024 to May 2025. The research method used in this study was an experimental design with a two-factor randomized block design and three replications. The factors tested in this study were: factor one, biochar, consisting of no biochar (B0), 200 g of biochar (B1), and 300 g of biochar (B2). The second factor is ecoenzyme, consisting of no ecoenzyme (E1), 50 ml/L ecoenzyme (E1), and 100 ml/L ecoenzyme (E2). The combination of these two factors yields 9 combinations with 3 replications per plant, resulting in 27 experimental units. The observed variables in coffee plants included morphological and physiological characteristics of Robusta coffee plants. Morphological variables included plant height (cm), stem diameter (cm), and number of leaves (pieces). Physiological variables include leaf area index (cm²/m²), leaf greenness (units), stomatal density (mm²), stomatal opening width (μm), chlorophyll content (mg/L), relative leaf moisture content (%), and growth rate (cm/day).

The results of the study indicate that the application of biochar significantly affects plant height (cm), stem diameter (cm), and growth rate (cm/day). The application of ecoenzyme significantly affects the number of leaves (pieces), chlorophyll content (mg/L), and relative leaf moisture content (%). There was an interaction between the combination of biochar and ecoenzyme treatments on plant height.