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Identifikasi Pertumbuhan dan Respon Fisiologis Bibit Acacia auriculiformis A. Cunn. ex Benth. dari Beberapa Famili Terseleksi pada Tingkat Cekaman Air yang Berbeda
Citra Kartini Ajeng Permatasari, Dr. Ir. Handojo Hadi Nurjanto, M.Agr.Sc., IPU.; Dr. Ir. Eko Bhakti Hardiyanto, M.Sc.
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IDENTIFIKASI PERTUMBUHAN DAN RESPONS FISIOLOGIS BIBIT *Acacia auriculiformis* A. Cunn. ex Benth. DARI BEBERAPA FAMILI TERSELEKSI PADA TINGKAT CEKAMAN AIR YANG BERBEDA

Citra Kartini Ajeng Permatasari[1], Handojo Hadi Nurjanto[2], Eko Bhakti Hardiyanto[3]

INTISARI

Cekaman air merupakan kondisi berkurangnya ketersediaan air yang menyebabkan penurunan tekanan turgor sel sehingga menghambat pertumbuhan dan perkembangan tanaman. Salah satu dampaknya adalah penutupan stomata yang dapat menurunkan laju fotosintesis. *Acacia auriculiformis* merupakan jenis pohon yang adaptif pada lahan kering. Penelitian ini bertujuan mengetahui pengaruh cekaman air dan perbedaan famili terhadap pertumbuhan dan respons fisiologis bibit *A. auriculiformis*, interaksi keduanya, serta mengevaluasi kecenderungan performa beberapa famili terseleksi pada berbagai tingkat cekaman air.

Penelitian menggunakan rancangan *split-plot* dalam *Randomized Complete Block Design* (RCBD), dengan cekaman air sebagai petak utama dan nomor famili sebagai anak petak. Perlakuan terdiri atas tiga taraf berdasarkan nilai *Fraction of Transpirable Soil Water* (FTSW), yaitu kontrol (W0) = 1,00, sedang (W1) = 0,40, dan berat (W2) = 0,15, serta lima famili *A. auriculiformis* asal Wonogiri (15M-61, 14M-22, 5M-112, 3M-79, dan 13S-2). Penelitian menggunakan tiga blok dengan tiga bibit pada setiap kombinasi perlakuan, sehingga total terdapat 135 bibit. Parameter yang diamati meliputi pertumbuhan, fisiologis, biomassa, dan bintil akar. Data dianalisis menggunakan *Analysis of Covariance* (ANCOVA) dan *Analysis of Variance* (ANOVA), dilanjutkan dengan uji DMRT pada taraf nyata 5%.

Hasil penelitian menunjukkan bahwa cekaman air berpengaruh nyata terhadap diameter, jumlah daun, laju fotosintesis bersih, laju transpirasi, kandungan klorofil, rasio tajuk-akar, dan jumlah bintil akar, tetapi tidak berpengaruh nyata terhadap tinggi, konduktansi stomata, *Leaf Water Potential*, *Specific Leaf Weight*, biomassa akar, biomassa tajuk, dan berat bintil akar. Famili berpengaruh nyata terhadap diameter, rasio tajuk-akar, dan berat bintil akar, sedangkan interaksi antara cekaman air dan famili tidak berpengaruh nyata terhadap seluruh parameter yang diamati. Cekaman berat (W2) memberikan tekanan penurunan yang lebih jelas dibanding cekaman sedang (W1). Secara deskriptif, beberapa famili menunjukkan performa relatif menonjol pada karakter tertentu, tetapi belum terdapat bukti statistik mengenai perbedaan toleransi antarfamili. Hasil penelitian memberikan informasi awal mengenai respons beberapa famili terhadap keterbatasan air sebagai dasar pengujian lanjutan di lapangan.

Kata Kunci: *Acacia auriculiformis*, cekaman air, famili, pertumbuhan, klorofil, toleransi kekeringan

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IDENTIFICATION OF GROWTH AND PHYSIOLOGICAL RESPONSES OF SEEDLINGS *Acacia auriculiformis* A. Cunn. ex Benth. FROM SEVERAL FAMILIES SELECTED AT DIFFERENT LEVELS OF WATER STRESS

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ABSTRACT

Water stress is a condition in which reduced water availability decreases cell turgor pressure, thereby inhibiting plant growth and development. One consequence is stomatal closure, which can reduce the photosynthetic rate. *Acacia auriculiformis* is a tree species adapted to dry land. This study aimed to determine the effects of water stress and family differences on the growth and physiological responses of *A. auriculiformis* seedlings, the interaction between the two factors, and the performance trends of several selected families at different levels of water stress.

The study used a split-plot design in a *Randomized Complete Block Design* (RCBD), with water stress as the main plot and family number as the subplot. Water stress had three levels based on the Fraction of Transpirable Soil Water (FTSW): control (W0) = 1.00, moderate (W1) = 0.40, and severe (W2) = 0.15. Five *A. auriculiformis* families from Wonogiri (15M-61, 14M-22, 5M-112, 3M-79, and 13S-2) were tested. Three blocks with three seedlings per treatment combination were used, giving 135 seedlings. Data were analyzed using Analysis of Covariance (ANCOVA) and Analysis of Variance (ANOVA), followed by Duncan's Multiple Range Test (DMRT) at the 5% significance level.

The results showed that water stress significantly affected the diameter, number of leaves, net photosynthesis rate, transpiration rate, chlorophyll content, shoot-root ratio, and number of root nodules, but did not significantly affect height, stomatal conductance, *Leaf Water Potential*, *Specific Leaf Weight*, root biomass, shoot biomass, and root nodule weight. Family significantly affected the diameter, shoot-root ratio, and root nodule weight, while the interaction between water stress and family did not significantly affect all observed parameters. Severe stress (W2) caused a more pronounced reduction than moderate stress (W1). Descriptively, several families showed relatively prominent performance in certain characters, but there was no statistical evidence regarding differences in tolerance between families. The results of the study provide initial information regarding the response of several families to water limitations as a basis for further testing in the field.

Keywords: *Acacia auriculiformis*, water stress, family, growth, chlorophyll, drought tolerance

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