

Efektivitas Tanaman C3 (*Melampodium Divaricatum* (Rich) DC.) dan CAM (*Neoregelia* Sp.) dalam Penyerapan CO₂ serta Penurunan Temperatur Internal Bangunan pada Green Roof = Effectiveness of C3 (*Melampodium Divaricatum* (Rich) DC.) and CAM (*Neoregelia* sp.) Plants in CO₂ Capture and Reduction of Internal Building Temperature on Green Roof

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Abstrak

Penelitian ini bertujuan untuk menganalisis efektivitas dua jenis tanaman dengan mekanisme fotosintesis yang berbeda, yaitu C3 (*Melampodium Divaricatum* (Rich) DC.) dan CAM (*Neoregelia* sp.), dalam menurunkan temperatur internal bangunan serta penyerapan karbon dioksida (CO₂) pada sistem green roof. Pengukuran eksperimen dilakukan selama periode 10 hari dengan menggunakan termokopel, weather station, dan alat ukur gas pertukaran daun LI-COR LI-6800. Hasil eksperimen menunjukkan bahwa tanaman C3 memiliki kapasitas penyerapan CO₂ jauh lebih tinggi (5,813 gram/hari) dibandingkan tanaman CAM (0,222 gram/hari). Secara termal, pengukuran langsung menunjukkan bahwa tanaman C3 memberikan penurunan suhu maksimum sebesar 3,4°C dibandingkan kontrol, sedikit lebih baik dibandingkan CAM yang mencapai 2,68°C. Sementara, simulasi menggunakan perangkat lunak EnergyPlus menunjukkan hasil berbeda dengan penurunan suhu yang lebih tinggi untuk tanaman CAM (4,38°C) dibandingkan tanaman C3 (4,11°C). Perbedaan ini disebabkan oleh asumsi kondisi ideal dalam simulasi serta adanya sumber panas tambahan pada eksperimen aktual. Penelitian ini menyarankan optimalisasi desain green roof dengan penempatan tanaman CAM di area yang teduh dan tanaman C3 di area yang terpapar sinar matahari intens untuk memaksimalkan efisiensi penyerapan CO₂ dan pendinginan bangunan.

.....This study aims to explore the effectiveness of two different plant types based on their photosynthetic pathways, C3 (*Melampodium Divaricatum* (Rich) DC.) and CAM (*Neoregelia* sp.) in reducing internal building temperature and capturing carbon dioxide (CO₂) on a green roof system. Experimental measurements were conducted over a 10-day period using thermocouples, a weather station, and a LI-COR LI-6800 leaf gas exchange system. Experimental results indicated that the C3 plant demonstrated significantly higher CO₂ capture capacity (5.813 grams/day) compared to the CAM plant (0.222 grams/day). Thermally, direct measurements showed that the C3 plant reduced peak internal temperature by 3.4°C compared to the control, slightly outperforming the CAM plant's 2.68°C reduction. However, simulations using EnergyPlus software presented contrasting results, with the CAM plant achieving greater temperature reduction (4.38°C) compared to the C3 plant (4.11°C). These discrepancies were attributed to idealized conditions assumed in simulations and additional heat sources within the CAM plant experimental cabin. This study suggests optimizing green roof designs by placing CAM plants in shaded areas and C3 plants in areas exposed to intense sunlight to maximize CO₂ capture efficiency and cooling performance.