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Comparative Assessment of Carbon Dioxide (CO2) Absorption Capacities in Selected Tree Species of Free Air CO2 Enrichment (FACE) and Control Plot at Tekam Forest Reserve, Pahang

Nurafiqah Nabilah Sarippudin[a], Azian Mohti[b], Faezah Pardi[ac*]

Structured Abstract

Background: The absorption of carbon dioxide (CO_2) by trees through photosynthesis is crucial for the Earth's carbon cycle and mitigating climate change. Rising CO_2 levels present significant environmental challenges, leading researchers to investigate the carbon sequestration capacities of various tree species. This knowledge is vital for effective forest management and climate change mitigation. By understanding how different tree species absorb CO_2, strategies can be developed to enhance carbon sequestration, reducing greenhouse gas emissions. This study aims to contribute to this understanding by examining specific interactions between tree species and their environment.

Methods: This study compared CO_2 absorption levels in two tree species, *Shorea ovalis* (*S. ovalis*) and *Calophyllum dioscurii* (*C.dioscurii*), using a Free Air Carbon Dioxide Enrichment (FACE) experimental site and control areas. Three replicates of each sapling were grown in polybags and placed in acrylic boxes for continuous 24-hour monitoring over three days. Environmental variables such as temperature, humidity, light, and CO_2 concentration were measured using CLTM sensors. CO_2 absorption was calculated by comparing initial and final CO_2 readings.

Results: Based on the results, *S. ovalis* absorbs more CO_2 under elevated CO_2 conditions (FACE). *S. ovalis* showed a weak negative correlation between temperature and CO_2 absorption and a positive correlation with humidity, indicating that higher temperatures reduce CO_2 absorption while higher humidity promotes it. Conversely, *C.dioscurii* performed better at ambient CO_2 levels, with temperature increases enhancing CO_2 absorption at the control site but reducing it under elevated CO_2 conditions. Humidity had a positive correlation at the FACE site but a weak negative correlation at the control site.

Conclusion: In conclusion, forest trees are crucial in reducing greenhouse gas emissions and mitigating climate change. *S. ovalis* demonstrated a greater capacity for CO_2 absorption under elevated CO_2 conditions, while *C. dioscurii* showed varying responses depending on environmental factors. These findings highlight the importance of selecting and managing tree species based on their carbon absorption efficiency to optimize forest contributions to climate change mitigation. Reforestation efforts should consider species-specific responses to CO_2, temperature, and humidity to maximize carbon sequestration in future climate scenarios.

Keywords: Free Air Carbon Dioxide Enrichment (FACE), Carbon Sequestration, Tree Species CO_2 Absorption

*Correspondence: faezahpardi@uitm.edu.my

[a] School of Biology, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia

[b] Forestry and Environment Division, Forest Research Institute Malaysia. 52109 Kepong, Selangor Darul Ehsan, Malaysia

[c] Institute for Biodiversity and Sustainable Development, Universiti Teknologi MARA. 40450 Shah Alam, Selangor Darul Ehsan, Malaysia.