Comparison of stand transpiration of a palm (*Ptychospermamacarthurii*) and a tree (*Tabebuiaargentea*) species and their variations with weather conditions in a roof garden in ChulalongkornUniversity

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Abstract: Global warming is a significant and ongoing problem to our planet as it induces drought, flood, and climate change and also affects biodiversity. Many countries in certain regions may suffer from increased intensity and frequency of drought events. Urbanization is another emerging issue and can intensify the global warming due to dense population and activities driving carbon dioxide emission. Therefore, urban greening has been imposed in many cities to mitigate such adverse effects. The severe droughts will influence tree water use and potentially affect the performance of urban trees. To explore selectively planting drought-tolerant trees that use water conservatively will lead to efficient urban water management. Here, we studied water use of a palm species (*Ptychospermamacarthurii*) and a tree species (*Tabebuiaargentea*) in a roof garden, using the heat dissipation method to measure their sap flux density (J_s).We found that palms had higher sap flux density (the product of $J_s$and sapwood area) compared to trees in both rainy and rain-free conditions. Sap flux density in palms had exponentially saturated pattern with vapor pressure deficit (VPD), representing atmospheric demand, in both conditions, suggesting stomatal sensitivity at high VPD. However, variations of sap flux density in trees with VPD were different under rainy and rain-free conditions. Tree sap flux density in rain-free condition had exponentially saturated pattern whereas that in rainy conditions followed a linear function because of non-limiting water availability. Our results indicated that trees closed their stomata at a slower rate and had lowerstand transpiration rate than palms (0.59 ± 0.13 mm day^{-1} *versus* 2.01 ± 0.31mm day^{-1}, respectively). Thus, when trees and palms suffer from drought, palms will potentially dry out faster than trees. Additionally, we derived a simple model using daily sap flux density to estimate monthly and annual sums of water use. Overall, palms stand transpirationhad 3.4-times higher than trees in our site. This study provides quantitative insights into tree and palm water use characteristics which will stronglybenefit water management policy, particularly when the planet face severe drought in the future.

Keywords: Stand transpiration, urban greening, water management,VPD

TA 010