Thermal Acclimation Potential of Leaf Photosynthesis of Two Pioneer Seedling Species to Increase in Average Growth Temperature

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Climate change has resulted in higher daily, seasonal, and annual mean temperatures. Many plants are known to adjust their photosynthetic characteristics by changing the optimum temperature of photosynthesis (thermal acclimation of photosynthesis) in response to changes in growth temperature. Degraded lands experience high ambient temperatures and moisture stress, and hence, it is important to understand the photosynthetic characteristics of pioneer seedling species used for land restoration, in response to both increases in growth temperature and soil moisture stress conditions. Thus, in this study two pioneer seedling species, namely, *Macaranga peltata* (*Kanda*) and *Neolitsea cassia* (*Dawul Kurudu*), were established in two thermal environments: 24.46±0.11 ˚C and 27.97±0.16 °C, at field capacity (FC) and water-stress conditions (WS, i.e., 50% of the available water). The temperature response of rate of light saturated net photosynthesis (A_{sat}) was determined at 25-35 °C leaf temperature range. At the FC, both *M. peltata* and *N. cassia* showed a significant increase ($P<0.05$) in the optimum temperature (T_{opt}) of photosynthesis from a lower thermal environment to a higher thermal environment. This demonstrated the thermal acclimation potential of the two pioneer species to higher average growth temperatures. However, when the average growth temperature increased in water-stress condition, none of the two pioneer species showed a significant increase ($P>0.05$) in T_{opt}. Rates of light-saturated net photosynthesis (A_{sat}) were significantly reduced ($P<0.05$) from the FC to water-stress conditions in *M. peltata*, however, not in *N. cassia*. Therefore, *N. cassia* (*Dawul Kurudu*) can be considered a better performing pioneer species at high growth temperatures along with water-stress conditions, when compared to *M. peltata (Kanda*).

Keywords: Acclimation, Field capacity, Photosynthesis, Restoration, Water stress

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