Newly Developed Leaves of Two Pioneer Seedling Species; Macaranga Peltata and Neolitsea Cassia Exhibit Thermal Acclimation of Photosynthesis to Increased Average Growth Temperature

P.B.G. Pathirana[1]*, K.W.L.K. Weerasinghe[2], S.A.C.N. Perera[1]

[1]*Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya, Sri Lanka*
[2]*Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka*
**buddhikagp@agri.pdn.ac.lk*

Photosynthesis is amongst the plant physiological processes that is highly sensitive to temperature. Hence understanding the photosynthetic potential to acclimate to rising temperatures is crucial for determining the fitness of a plant species to a given environment. Pioneer tree seedlings commonly used for the restoration of degraded lands often experience high temperature conditions; however, their ability to acclimate photosynthesis to rising temperatures remains poorly understood. Thus, in this study two pioneer seedling species, namely, *Macaranga 222otmail* (*Kenda*) and *Neolitsea cassia* (*Dawul Kurundu*), were established in two thermal environments: 24.5±0.1 °C and 28.0±0.2 °C, at field capacity (FC) for 6 months and newly developed fully expanded leaves were used to determine temperature response of light saturated net photosynthesis (A_{sat}) at 20-35 °C leaf temperature range. Then using A_{sat}-T curves, through a model fitting procedure optimum temperature (T_{opt}) for photosynthesis under the two thermal environments was determined for each species. The results revealed a significant increase ($p<0.05$) in the optimal temperature for photosynthesis (T_{opt}) when the average growth temperature was increased from 24.5±0.1 °C to 28.0±0.2 °C in both species. Further, A_{sat} of *M. 222otmail* at T_{opt} significantly increased ($p<0.05$), with rising average temperature in the growth environment, while it remained unchanged in *N. cassia*. Furthermore, the Leaf Mass per Area (LMA) of both species did not show a significant increase under the rising growth temperature. These findings demonstrate that seedlings of both *N. cassia* and *M. 222otmail* can successfully acclimate their leaf photosynthesis to increased average growth temperatures hence using both these species with high temperature optima can increase the success rate of reforestation and habitat restoration efforts.

Keywords: Photosynthesis, Temperature, Thermal Acclimation, Pioneer Species