

COMPARISON OF LONG-TERM TRANSPIRATION OF DIFFERENT TREE SPECIES IN SEPARATE CANOPY LAYERS IN A KANDYAN FOREST GARDEN

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Kandyan Forest Gardens (KFG s) are a specific vegetation type covering a considerable land area of the Central Province of Sri Lanka. Therefore, water use by KFG s form an important component of the catchment water balance of this area. KFG s consist of a mixture of tree species whose canopies are arranged in different vertical layers.

The study was conducted in a typical Kandyan Forest Garden located at Pilapitiya, Pilimathalawa within the agroecological region WM₂. A vegetation survey was carried out in this garden and it showed 201 trees belonging to 24 different species. Out of these, two tree species were selected to represent upper and middle canopy layers. They were jak (*Artocarpus heterophyllus*) and toona (*Cedrella toona*). Transpiration of these trees was measured as the sapflow in their trunk using thermal dissipation probes. Measurements of the weather parameters were also taken. The incident solar radiation was measured using the tube solarimeters. Relative humidity in the open and inside the KFG was measured by two solid state sensors. The soil moisture content at five soil depths (i.e. 20, 40, 60, 80 and 100 cm) was measured by gravimetric sampling. All the data except soil moisture were taken at 30 second time intervals integrated over five minutes and stored in the data logger. The measurements that were taken during the period from 25.12.2001 to 20.02.2002 were analyzed.

Both species showed a similar pattern of daily variation of sapflow. However, the sapflow was substantially greater in jak than in toona. The total water use of jak for the experimental period was 3881.25 kg/tree. The corresponding value of toona was 462.83 kg/tree. The upper canopy jak received a greater irradiance than middle canopy toona. There was a linear relationship between the radiation incident on jak and toona canopies.

Daily water use of the upper canopy jak showed a clear linear relationship with daily irradiance on its canopy. However, the water use of toona did not show such a relationship. In both species, there were significant negative linear relationships between daily sapflow and daily mean relative humidity. However, air temperature did not have a significant effect on sapflow of both jak and toona trees. The canopy leaf area of jak remained more or less constant during the experimental period. But in toona, the canopy leaf area increased during the latter part of the experimental period. Water use of both jak and toona did not show a significant relationship with the variation of soil moisture content of the top 1m of the soil profile. This indicated that the trees were extracting water from the deeper layers of the soil profile. It can be concluded from results of the present study that water use of a KFG is dominated by large upper canopy trees and that it is largely determined by the incident solar radiation. This study also showed that large trees in this ecosystem maintain their high levels of water use even during dry periods of the year by extracting water from deeper layers of the soil profile.