Low-tech cool: Shade trees for subtropical streets

April 21 2010

Shade trees are the superstars of urban landscapes. In addition to their intrinsic aesthetic qualities, these low-tech workhorses reduce air and noise pollution, provide habitat for wildlife, increase property values, and offer cool respite for harried urbanites. Strategically planted shade trees decrease energy usage in urban buildings, absorb carbon dioxide, and supply fresh oxygen. It's no coincidence that researchers around the world are working to find the best shade trees for all types of urban environments.

While studies have reported on the "cooling effect" of shade trees in temperate urban areas, similar studies for tropical or subtropical areas are limited. Climate conditions and popular tree species in the tropics or subtropics are quite different from those in more temperate regions. Now, a research team from the Department of Horticulture at National Taiwan University has published a comprehensive study in HortScience that offers recommendations for landscape designers and urban planners in subtropical regions. Bau-Show Lin and Yann-Jou Lin evaluated the differences in cooling effect of trees and bamboo grown in Taipei, Taiwan.

The effect of shade trees on the air and surface-soil temperature reduction under the canopy was studied in a park in Taipei City, Taiwan. Ten species of trees and two species of bamboo, which had tightly clustered tall stems and spreading branches resembling trees, were chosen for the study. Microclimate conditions under the tree canopies and an unshaded open space were measured repeatedly at midday

without precipitation. The researchers analyzed four characteristics of each plant related to cooling effect, determining that foliage density had the greatest contribution to cooling, followed by leaf thickness, leaf texture, and leaf color lightness. Regression analysis also revealed that solar radiation, wind velocity, and vapor pressure at the site had significant effects on temperature reduction attributable to shade trees or bamboo.

Twelve species in the study provided 0.64 to 2.52ºC lower air temperature and 3.28 to 8.07ºC lower surface-soil temperature under the canopies compared with the unshaded open site. When analyzed for "cooling effect", Chinese elm (*Ulmus parvifolia*) and Rose wood (*Pterocarpus indicus*) were the determined to be the most effective, while Golden shower tree (*Cassia fitula*), Autumn maple (*Bischofia javanica*), and Swollen bamboo (*Bambusa ventricosa*) were the least effective. "The shading of *U. parvifolia* reduced air temperature by 2.52ºC but that of *C. fitula* only by 0.64ºC; the difference was almost fourfold", noted the authors.

"This research could help maximize the cooling effect of shade trees by careful selection of species based on their canopy and leaf characteristics", the authors said. They added that although the field studies were carried out in a park, the results can be applied to shade trees in other subtropical urban environments.

More information: The complete study and abstract are available on the ASHS HortScience electronic journal web site: hortsci.ashspublications.org/c … ent/abstract/45/1/83

Provided by American Society for Horticultural Science