
Assessing Capturing Efficiency of Different Tree Species on Fine Particulate Matter (PM) for Mitigation Strategies in Urban Areas

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Abstract Text:

Particulate matter (PM) has been concerned for its threatening impacts on allergic, mutagenic, and carcinogenic problems to human health in Taiwan. To reduce PM pollution, trees are generally promoted as an environmentally friendly solution in urban areas. However, capabilities of tree species in capturing PM are rarely investigated. As a result, we aimed to quantify the capturing efficiency of different tree species. We selected 9 major street tree species, then took photos under the scanning electron microscopy (SEM) and analyzed the composition of the fine particles, and counted the numbers of PM with diameter no larger than 2.5 μm . We found that PM capturing efficiency appeared a wide variation across tree species, in which Poonga-oil Tree possessed the greatest efficiency, followed by Marabutan, Cajeput Tree, Palimara Alstonia, Madagascar Almond, Flame Goldrain Tree, Javanese Bishopwood, Comphor Tree, and Sweet Gum had the least. We further assessed contact angle and groove width of the leaves in relation to tree's capturing efficiency, and revealed that for the investigated 9 species, fine leaf structure (represented by groove width) had higher correlation to the capturing efficiency than the surface wettability (represented by contact angle). As a result, to reduce the PM pollution in urban areas of Taiwan, governments could consider planting tree species with surface properties and micromorphology of tree leaves contributing to higher PM_{2.5} capturing efficiency.