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Containerized Technology: Long Term Observation of the Growth Potential of Container Trees

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Example of a large container

Growing a tree in a container or in the ground for any site where the potential for root expansion is limited can result in a reduction in the overall growth of the tree. Containers tend to also affect the storage of water, and may cause water stress. Conversely, a perched water table can develop waterlogged conditions and problems with aeration.

Prolonged confinement with limited rooting space is likely to result in root distortion, girdling, and in extreme cases, strangulation. In urban forests, transpirational water loss can be very high and often exceed the water held in the container's reservoir. Although this deficit can be supplemented through irrigation, the cost of irrigation may put a strain on the budgets allocated to municipalities and departments of public works. **The purpose of this study was to review some of the important considerations involving urban trees and container planting.** The key aspects investigated were, the **morphometric features of trees in containers** while the earlier part of this study was dedicated to the design and development of a large container that was robust and rigid, made from a composite polymer of 60% fibreglass and 40% epoxy, and coated with poly-urea. The design also took into account the requirement for good water percolation.

The fast paced development of urban environments create the opportunity for container trees where, rather than have a forest of fully grown trees loss to urban development, container grown trees can be relocated.

Root System

	Pouteria obovata	*Calophyllum inophyllum*
Root dry weight (kg)	10	8.7
Root diameter (cm)	Range: 1 to 4	0.5 to 3.5
Root plate area (m^2)	1.34	1.19
Root plate depth (m)	0.87	0.62
Soil moisture (@0.75 m) (%)	16.3%	18.2%
Soil oxygen (%)	14.8	15.3

n=5
Container dimensions: 1.8 (diameter) by 1.5 (height) in metres with perforation for drainage interspersed throughout the container wall

Root system of *Calophyllum inophyllum*

Root system of *Pouteria obovata*

Stem & Foliage

	Pouteria obovata	*Calophyllum inophyllum*
Height (m)	8	6
DBH (cm)	18	21
Crown volume (m^3)	35	30
Foliage dry weight (kg)	9.7	6.6
Stem (& branches) dry weight (kg)	15.8	11
Chlorophyll content - Optical density difference	42	38
F_v / F_m	0.785	0.779

n=5
F_v / F_m: variable fluorescence/maximum fluorescence – represents the maximum quantum efficiency of Photosystem II

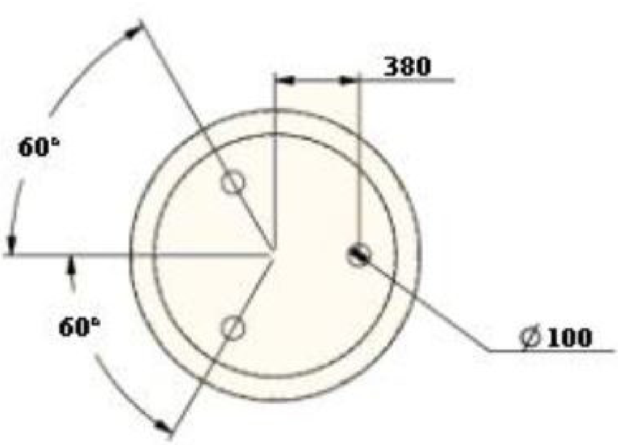
Calophyllum inophyllum

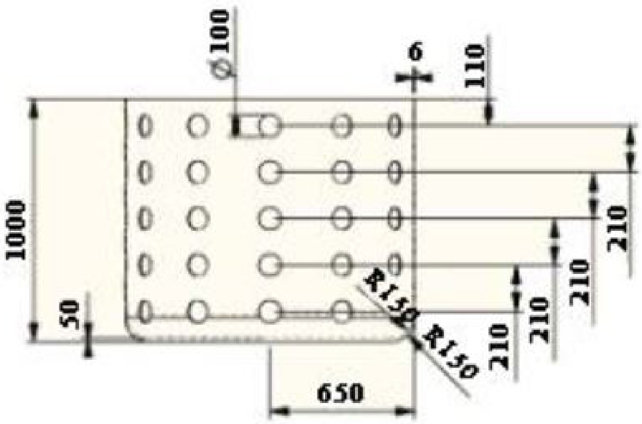
Pouteria obovata

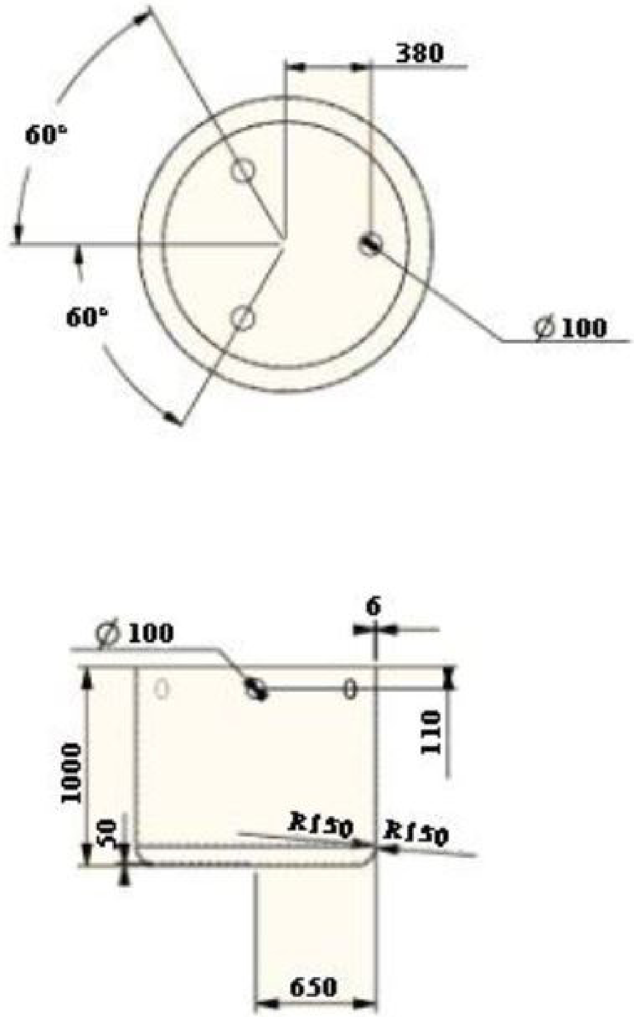
The trees were grown in containers since 2012 (in Approved Soil Mix) and these species were selected due to their compact crown structure. A five-year growth period indicated that both species were healthy with lush and vigorously growing foliage. There were no surface roots visible on the soil surface but as the containers were emptied of soil, it was observed that the root system for *C. inophyllum* tended to be more fibrous than structural. While some 20% more structural roots were observed for *P. obovata* (reflected in the higher values for root dry mass and root plate area), the overall root morphology also tended to be fibrous. The dominant development of fibrous roots will best explain the healthy aboveground growth observed in both species but the disproportional root shoot ratio raises questions about tree stability.

Although the roots utilised the spread of the container (1.8 m diameter), the dimension of depth was less explored. The average root plate depth across species was 0.8 m with the greatest depth observed at 1.2 m but this was for one specimen of *P. obovata* only. There was also no indication that the roots had grown out of the container through the perforations situated along the walls of these containers and there were also no signs of waterlogged conditions present in these containers. Neither was water stress observed in these trees. The trees never received any irrigation and was watered through rainfall only. There was also no signs of girdling or strangling roots.

We propose a modification in the design of the container for better management of container trees. A downsized container which will result in the reduction in tree size may be a preferred approach to the existing container dimensions (1.8 m diameter; 1.5 m height).







A downsized version with an inner diameter of 1.3 m, and a height of 1 m will best fit the root growth potential of these species and develop smaller trees with a proportional root shoot ratio for greater tree stability with little to no impact in the overall health and growth of container trees.

CONCLUSIONS & APPLICATION

- Morphometric features of both species did not differ significantly.
- The aboveground growth was generally healthy while the root system was far less extensive than anticipated.
- The results here suggest that container trees are still a feasible option especially in situations where the growth period at the site will be short lived.
- The ability to relocate these trees without having to affect the growth will be a desirable option in preserving the lifespan of the tree since they grow well despite the restrictive rooting environment.
- With the limited growth potential of the root system, a downsized container will be beneficial in maintaining a proportional root to shoot ratio.
- Smaller containers will also have the benefit of enhanced mobility for transport.
- Future research may consider the use of other tree species to validate the findings presented here.

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