THE UNIVERSITY OF MELBOURNE

School of Ecosystem and Forest Sciences

Spontaneous green roofs

Fast and slow, but functional: the opportunities of spontaneous green roofs

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Background

Cities are tough on plants - displacing, simplifying species richness, limiting dispersal and slowing establishment of vegetation. Yet some plants persist and succeed in urban landscapes without human intervention. Understanding the success of these plants could improve green space management. These plants are usually known as 'weeds', but in scientific literature we refer to them as 'spontaneous'.

Spontaneous plants share our social and ecological timeline, and reflect our transition to sedentary life, but despite these potential benefits and opportunities, spontaneous vegetation in urban ecosystems remains poorly understood.

Research Questions

My research focuses on spontaneous plants that colonise and persist on green roofs. Green roofs are engineered systems for growing plants on rooftops.

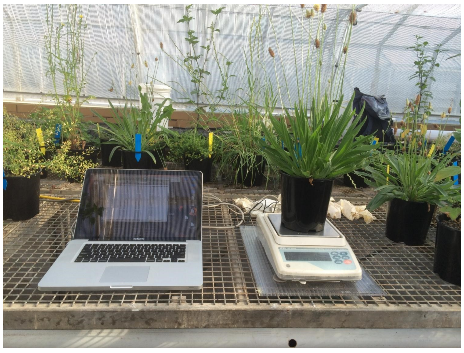
Q: How do the survival strategies of spontaneous plants - along with the green roof environment itself - influence their success?

Q: How do spontaneous plants influence green roof functionality?

In a recent experiment, I determined the water-use strategies and drought response of nine common spontaneous green roof plant species and related these to their growth rate: from fast to slow[1]. I hypothesised that fast species would use more water under well-watered conditions and be more sensitive to drought stress under water-deficit conditions than slow species.

Approach

I collected seeds of nine common spontaneous green roof plant species from across metropolitan Melbourne and propagated them in pots of scoria green roof substrate. Half of the plants were well-watered and the other half subject to water deficit. To do this, I weighed pots each day to determine water loss and gave plants under water deficit only 30% of what I gave well-watered plants. After growing these plants for 12 weeks, I determined plant drought response by measuring the relative water content of the leaves[2,3]. I also estimated the relative growth rate of these species from their increase in biomass under well-watered conditions[4].



Findings

Among the nine spontaneous species, there were a range of water-use and drought response strategies linked to their relative growth rate. Fast species had greater water-use under well-watered conditions and therefore

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would use more of the rainfall stored by green roofs, potentially increasing the green roof's stormwater mitigation. Slow species maintained higher leaf relative water contents under water-deficit and were therefore less sensitive to drought stress and could have greater survival on green roofs in summer. A mixture of fast and slow species could therefore provide stormwater mitigation and maintain vegetation cover on green roofs.

Research Impact

Green roofs are not static; the spontaneous plant communities on green roofs change over time[5]. By understanding the variation in plant relative growth rate and drought resilience, we can select for diversity in fast-slow strategies to build resilience in vegetation communities and enhance their functionality. Spontaneous vegetation on green roofs can fill empty niches, supplement long-term biodiversity, and enhance ecosystem resilience[5,6]. My work indicates that these species may also assist in stormwater mitigation.

In an increasingly urbanised world with uncertainty around future climate, the practical benefits of spontaneous vegetation may outweigh other considerations. Adoption of low-cost unmanaged green roofs could provide stormwater mitigation, biodiversity and habitat, although further research necessary.

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