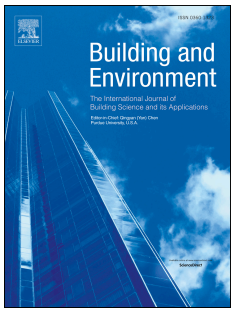
# Accepted Manuscript




An assessment of the atmospheric particle removal efficiency of an in-room botanical biofilter system

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# An assessment of the atmospheric particle removal efficiency of an in-room botanical biofilter system

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***Abstract***

In addition to the growing requirement to reduce building energy needs, demand has arisen to find sustainable methods of improving indoor air quality. Recent advances in green wall technology have led to the development of activated systems, termed botanical biofilters, that move air through the plant growth substrate to increase the rate at which the interior atmospheric environment is exposed to the components of the plant-substrate system that are active in air pollutant removal. Development of this technology is moving towards green wall integration within building air conditioning and ventilation systems. The work presented here describes an evaluation of several parameters essential for determining the functionality of a modular botanical biofilter, as well as experiments to systematically determine the filtration performance of the device, specifically the single-pass particulate rem filtration efficiency was evaluated and defined. The maximum filtration efficiency for total suspended particulate matter peaked at an air flow rate of 11.25 $L.s^{-1}$ through the 0.25 $m^2$ filter, with any increases in air flow rate met with a reduction in efficiency. The system recorded removal efficiencies were 53.35 ± 9.73 % for total suspend particles, 53.51 ± 15.99 % for $PM_{10}$, and 48.21 ± 14.71 % for $PM_{2.5.}$ Comparisons were made against the single pass efficiency of the system without the botanical component, as well as a common in-duct pleated panel air filter, indicating that further development is required to enhance the filtration capacity of the system if it is match current air filtration standards.

***Keywords***
Sustainable buildings; active living wall; air filtration; clean air delivery rate; HVAC systems; phytoremediation

***Highlights***
A botanical biofilter was tested for removal efficiency for particulate matter.
Three particle fractions were considered.
Comparisons were made against a common in-duct HVAC filter.
The system has moderate removal efficiencies, which could be improved.
Removal efficiency was 53% for large particles, 54% for $PM_{10}$ and 48% for $PM_{2.5}$