

Evaluation of common indoor air pollutant reduction by a botanical indoor air biofilter system

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Abstract

Indoor air pollutant issues have attracted various researchers to investigate alternative solutions to non-biofiltration systems, such as common air purifiers that are generally used in the market. Research has found that active botanical biofilter systems are efficient in filtering indoor air pollutants, as well as providing a refreshing environment to surroundings. The research presented here describes a developed prototype of a botanical indoor air biofilter (BIAB) and evaluates the performance of the BIAB system in reducing common indoor air pollutants. The system was assessed for its single-pass filtration across an aerosol containing particles with the diameter of 2.5 μm (PM_{2.5}), 10 μm (PM₁₀) and volatile organic compounds (VOCs) by burning aromatic cone incense. The system comprises three working sections: a fraction of horizontally grown plants with growth media as the botanical biofiltration section, an evaporative medium (an additional component from a commercial active botanical biofilter) and a mechanical ventilation system that supplies cleaned air to the surroundings. The BIAB system recorded the removal efficiencies of $54.5 \pm 6.04\%$ for PM_{2.5}, $65.42 \pm 9.27\%$ for PM₁₀ and $46 \pm 4.02\%$ for VOCs.

Keywords

Indoor air filtration, Particulate matter, Volatile organic compounds, Active botanical biofilter, Evaporative media, Filtration efficiency

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Introduction

In the last few decades, environmental researchers have been focusing on indoor air quality (IAQ) issues and its improvement strategies.^{1–5} The concern of a better IAQ is still progressing, in line with the latest technology of air conditioning and mechanical ventilation (ACMV) systems in improving indoor environmental quality (IEQ). With the rapid growth and greater development around the world today, the quantity of road vehicles and industrial development would also increase year by year; such factors are the endless major contributor of air pollutants.⁶ Generally, the IAQ is influenced by outdoor pollutants, and most of the indoor contaminants are derived from outdoor air.⁷ However, indoor contaminants are also increased by indoor pollution sources such as the air fresheners and other household products

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