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J Pollut Eff Cont 2017, 5:2 (Suppl)
DOI: 10.4172/2375-4397-C1-006



# Active botanical biofiltration implementation for air pollution mitigation

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**Statement of the Problem:** Air pollution is an international problem having adverse effects on human and environmental health. For developed countries, it has been estimated that outdoor air pollution results in a health care and associated costs burden of US$828 trillion annually with just under US$90 trillion associated with indoor air pollution. Whilst physiochemical methods of indoor air pollution control are effective in the short term, they have many disadvantages including high energy use, expensive installation, regular maintenance, a variable capacity to remove $CO_2$, VOC and $O_3$ emission and an inability to remove all gaseous pollutants at once. Botanical biofiltration is becoming a popular alternative method for air pollution mitigation with many associated benefits. However, research regarding the efficiency of active indoor botanical biofilters is currently insufficient. The purpose of this study was to determine the air filtering ability of an active botanical biofilter and to test the botanical health from high pollutant exposure.

**Methodology & Theoretical Orientation:** Chamber studies were conducted for $CO_2$ and PM removal efficiency at different air flow rates. Biochemical, physiological and morphological plant health tests were conducted on 8 ornamental species prior to and at the conclusion of a 5 week elevated pollutant exposure period.

**Findings:** Active botanical biofilters displayed an ability to reduce both $CO_2$ and PM levels. PM removal increased with increasing air flow rate, whilst having a negligible effect on $CO_2$ removal. All tested ornamental species exhibited an ability to tolerate the high pollutant exposure; however, *F. lyrata* was the most tolerant.

**Conclusion & Significance:** Pollutant removal can be increased from the use of an active botanical biofilter system. Plant species tolerance to pollution varies, highlighting the need for careful selection of tolerant species such as *F. lyrata* for system use in high pollution environments.

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