

PLANT SCIENCE RESEARCH AND PRACTICES

Plants and Microbes in an Ever-Changing Environment

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Editor



NOVA

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Chapter 3

BIOREMEDIATION OF AIRBORNE HAZARDOUS VOLATILE ORGANIC COMPOUNDS (VOCs)

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ABSTRACT

Volatile organic compounds (VOCs) are continuously emitted to the atmosphere by anthropogenic or biological means. VOCs are globally important trace gas species that are relevant to both human health and global climate change. Many of these VOCs such as aromatic hydrocarbons, aldehydes, and ketones are toxic to humans because of their carcinogenic and mutagenic properties. These VOCs also generate large quantity of secondary organic aerosols that could affect climate by forming cloud condensation nuclei. They have capacity to form toxic and phytotoxic radical intermediates. Some of the VOCs are irritants and cause malodor nuisance. In indoor environments, they become more relevant considering the increasing tendency of people to spend their maximum time indoor. These indoor sources are fabrics, carpets, glues, and building materials. There is a growing concern for developing low-cost and reliable methods for reducing the concentrations of these compounds in indoor air. However, there is no single fully satisfactory method for VOC removal from indoor air. Most of the VOCs removal methods (e.g., filtration, electrostatic precipitators, adsorption, photolysis, photocatalysis, membrane separation, etc) are of high cost and use energy in one way or another. Thus, biological methods such as botanical purification and biofilter that utilize the plants and microbes can be better alternatives for management of these hazardous substances. Based on the fact that there is uptake of VOCs by plants, selecting suitable plant species for control of VOCs is a good biotechnological tool. This can further be supported by microbial activity in rhizosphere that could help to develop an eco-friendly biotechnological method to curb the harmful effect of these hazardous substances, especially indoor.

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