

PLANT BIOTECHNOLOGY GREEN FOR GOOD V

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Volatile compounds other than CO₂ emitted by different microorganisms promote distinct post-transcriptionally regulated responses in plants

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A “box-in-box” co-cultivation system was used to investigate plant responses to microbial volatile compounds (VCs), and to evaluate the contributions of organic and inorganic VCs (VOCs and VICs, respectively) to these responses. *Arabidopsis* plants were exposed to VCs emitted by adjacent *Alternaria alternata* and *Penicillium aurantiogriseum* cultures, with and without charcoal filtration. No VOCs were detected in the headspace of growth chambers containing fungal cultures with charcoal filters. However, these growth chambers exhibited elevated CO₂ and bioactive CO and NO headspace concentrations. Independently of charcoal filtration, VCs from both fungal phytopathogens promoted growth and distinct developmental changes. Plants cultured at CO₂ levels observed in growth boxes containing fungal cultures were identical to those cultured at ambient CO₂. Plants exposed to charcoal-filtered fungal VCs, non-filtered VCs, or super-elevated CO₂ levels exhibited transcriptional changes resembling those induced by increased irradiance. Thus, in the “box-in-box” system, (a) fungal VICs other than CO₂ and/or VOCs not detected by our analytical systems strongly influence the plants’ responses to fungal VCs, (b) different microorganisms release VCs with distinct action potentials, (c) transcriptional changes in VC-exposed plants are mainly due to enhanced photosynthesis signaling, and (d) regulation of some plant responses to fungal VCs is primarily post-transcriptional.