Amplification of early drought responses caused by volatile cues emitted from neighboring tea plants

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Title

Amplification of early drought responses caused by volatile cues emitted from neighboring tea plants

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Abstract

Plants have developed sophisticated mechanisms to survive in dynamic environments. Plants can communicate via volatile organic compounds (VOCs) to warn neighboring plants of threats. In most cases, VOCs act as positive regulators of plant defense. However, the communication and role of volatiles in response to drought stress are poorly understood. Here, we showed that tea plants release numerous VOCs. Among them, methyl salicylate (MeSA), benzyl alcohol, and phenethyl alcohol markedly increased under drought stress. Interestingly, further experiments revealed that drought-induced MeSA lowered the abscisic acid (ABA) content in neighboring plants by reducing 9-cis- epoxycarotenoid dioxygenase (NCED) gene expression, resulting in inhibition of stomatal closure and ultimately decreasing early drought tolerance in neighboring plants. Exogenous application of ABA reduced the wilting of tea plants caused by MeSA exposure. Exposure of Nicotiana benthamiana to MeSA also led to severe wilting, indicating that the ability of drought-induced MeSA to reduce early drought tolerance in neighboring plants may be conserved in other plant species. Taken together, these results provide evidence that drought-induced volatiles can reduce early drought tolerance in neighboring plants and lay a novel theoretical foundation for optimizing plant density and spacing.