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Eran Pichersky, J.P. Noel, N. Dudareva.
Biosynthesis of Plant Volatiles
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Plants synthesize compounds that can easily volatilize and escape into the ambient air. These compounds, called volatiles, are emitted from open flowers to attract pollinators and act as aroma compounds in fruits. Many volatile compounds, which are toxic when ingested by microorganisms and insects, are made in the vegetative parts of the plant and provide an additional defense mechanism for the plant. In some cases, plants under attack by herbivores, such as caterpillars, will emit volatiles that attract insects that prey on the herbivores. Despite the many beneficial aspects of volatiles, little is known about how plants create these compounds. This work expands on the knowledge of the biochemical pathways that lead to the synthesis of plant volatiles and identifies the enzymes and genes controlling these pathways. The synthesis of plant volatiles involves the enzymatic removal or modification of the water-soluble parts of common metabolites. This study describes the many groups of plant enzymes that make molecules less water-soluble and therefore more volatile. Each group of related enzymes has the ability to catalyze similar reactions, but each individual enzyme has adapted the ability to make a somewhat different modification, creating a different volatile molecule. This explains how each plant species can synthesize distinct arrays of volatiles. The information from this study, together with identified enzymes and genes that participate in the formation of many plant volatiles, will allow researchers to manipulate volatile biosynthesis in plants by marker-assisted breeding or genetic engineering. The outcomes will produce more fragrant flowers for consumers, more attractive flowers for pollinators, and more insect-resistant crop plants.

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